# AMERICAN MACHINIST

*February* 22, 1939

MEN AT WORK—*Ford's $34,000,000 modernization program makes work for equipment makers and his own shop employees (page 69)*


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# Tool Engineers,

# Detroit *Bound...*

# Watch for the next issue

● It will bring you a preview of the Second Annual Machine & Tool Progress Exhibition at Detroit, March 14 to 18. Features of this balanced issue are:

1. A complete program of the A.S.T.E. convention.
2. A list of exhibitors.
3. A special section on Cutting Materials, dealing with all types of tool materials and how you can make them serve you most efficiently.
4. Several special articles on tool engineering.
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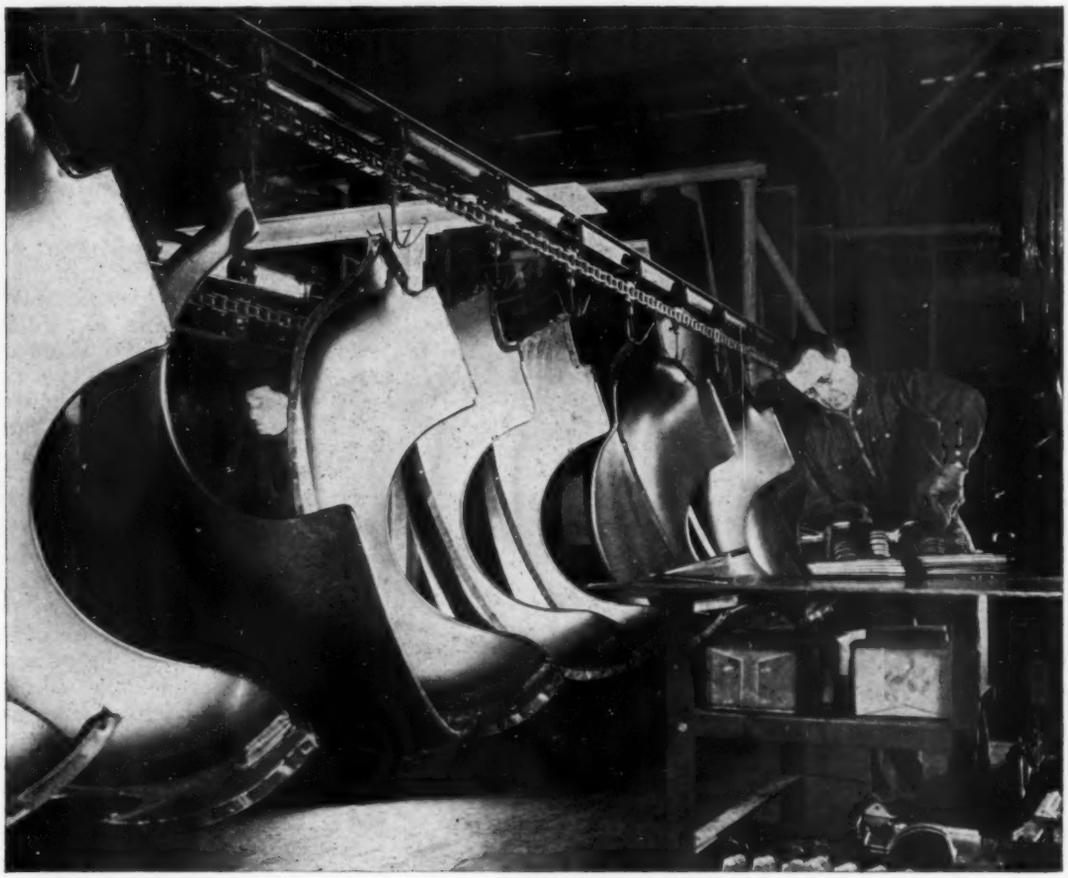
This issue, dated March 8, is timed to give you an opportunity to plan your convention visit most effectively. Plan to be there. But, whether or not you can attend, this issue will serve as a permanent record of the Exhibition.

**AMERICAN MACHINIST**

*Giving you the best in Metal-Working Practice*

ESTABLISHED 1877 **AMERICAN MACHINIST** BURNHAM FINNEY, Editor



*Fenders move in an endless row on part of the mechanized system of material handling in the newly opened press shop*

# Ford Opens Two New Shops

## River Rouge adds a press shop and a die shop which centralize current sheet-metal operations while allowing for possible future shifts

By MAJOR H. C. DECKARD

On November 10, 1937, ground was broken at River Rouge for a $34,000,000 expansion and modernization program. One year later, two of the largest units—the press shop and the tool and die shop—had been erected, equipped and placed in almost full operation.

Both of these new shops are examples of the present Ford policy of designing buildings around machinery layouts. Most unusual of many new features in factory construction is the use of H-beam piling driven 90–110 ft. to hardpan, to support the heavy equipment and building loads. All abutments, building foundations and machine foundations are of reinforced concrete resting on the tops of the H-beams. Approximately 5,000 tons of steel were driven into the earth.

Millions of dollars worth of new machine tools and presses went into these two new shops, besides vast quantities of electrical and materials handling equipment.

In the tool and die shop alone there are 1,311 machines, and 508 are new. Of the new machines, 260 were bought to increase capacity and 248 for replacements.

The main reason for setting up the tool and die shop was to concentrate new work under one roof and to provide facilities to do any job, no mat-

ter how large or small. Toolrooms scattered throughout various production divisions will now do only maintenance work except in the case of the press shop toolroom.

There are three divisions in the tool and die shops: (1) body die and small die construction, wherein the bulk of the new equipment is concentrated for the purpose of providing tools to the new press shop; (2) the tool, jig, fixture and gage division that supplies such material to all production divisions and also has a great deal of new equipment, and (3) the machine construction and repair division that builds new machines and special equipment and performs general overhaul on all kinds of plant machinery. This last division takes up the slack when new model work is out of the way, and is responsible for the relatively steady employment enjoyed by Ford tool and diemakers.

The tool and die shop is set a quarter of a mile from the nearest building. Monitors, side walls and end walls are largely of glass; columns are kept to a minimum and are placed to afford maximum convenience in handling the work. Overhead steel work and air-conditioning ducts, as well as the roofs and side walls, are painted white. All electrical wiring and other services are obtained from underground tunnels to keep the superstructure free of light-obstructing equipment. The equipment is all painted a dark, "crane" blue to rest the eye and prevent glare.

A central high bay and two lower bays on either side, run the entire 1,225 ft. length of the shop. Monitors over the low bays run at right angles to the central lengthwise monitor to bring a maximum of daylight to every square ft. of floor space. No hand hoists are used in any part of the shop. Instead, all lifting is done by electric hoists, traveling hoists and the main cranes.

Altogether, two 50-ton traveling cranes in the main bay, five 25-ton cranes, forty-four 10-ton cranes and 119 electric hoists will be installed. The 50-ton cranes have an 86 ft. span and a clearance to the hook of 32 ft. The span of the 10-ton cranes is 40 ft. With this amount of hoisting equipment, the largest and smallest dies can be transferred to the machines and set up with a minimum of difficulty.

There is but one floor in the tool and die shop. Cedar block set in mastic provides a comfortable walking surface and can easily be ripped up if machines are to be rearranged. Balconies along the two sides of the building are divided into four sections intended solely for the comfort of the men. Toilet facilities are placed on the main floor, but the balconies have these as well as washrooms, showers, dining room and coat room in each section. Tile walls and floors, which enhance the appearance of these sections, are sanitary and easily cleaned.

About three months were required to move older equipment from many scattered locations and to install new arrivals. The method followed was to move a fourth or a third of a department in an outside toolroom to the new location at one time. The men would pack up their work and tools in the old location one day, and except for the largest and heaviest machines, the equipment would be running in the new location the next day.

With the Keller die-sinking machines—17 installed, including two of the largest so far made—and 50-ton Southwark die tryout presses, it is possible for the organization to make dies in three weeks instead of the three months formerly required. Surface plates for die layout are fitted with electrical outlets every few feet.

Dies are made and assembled on

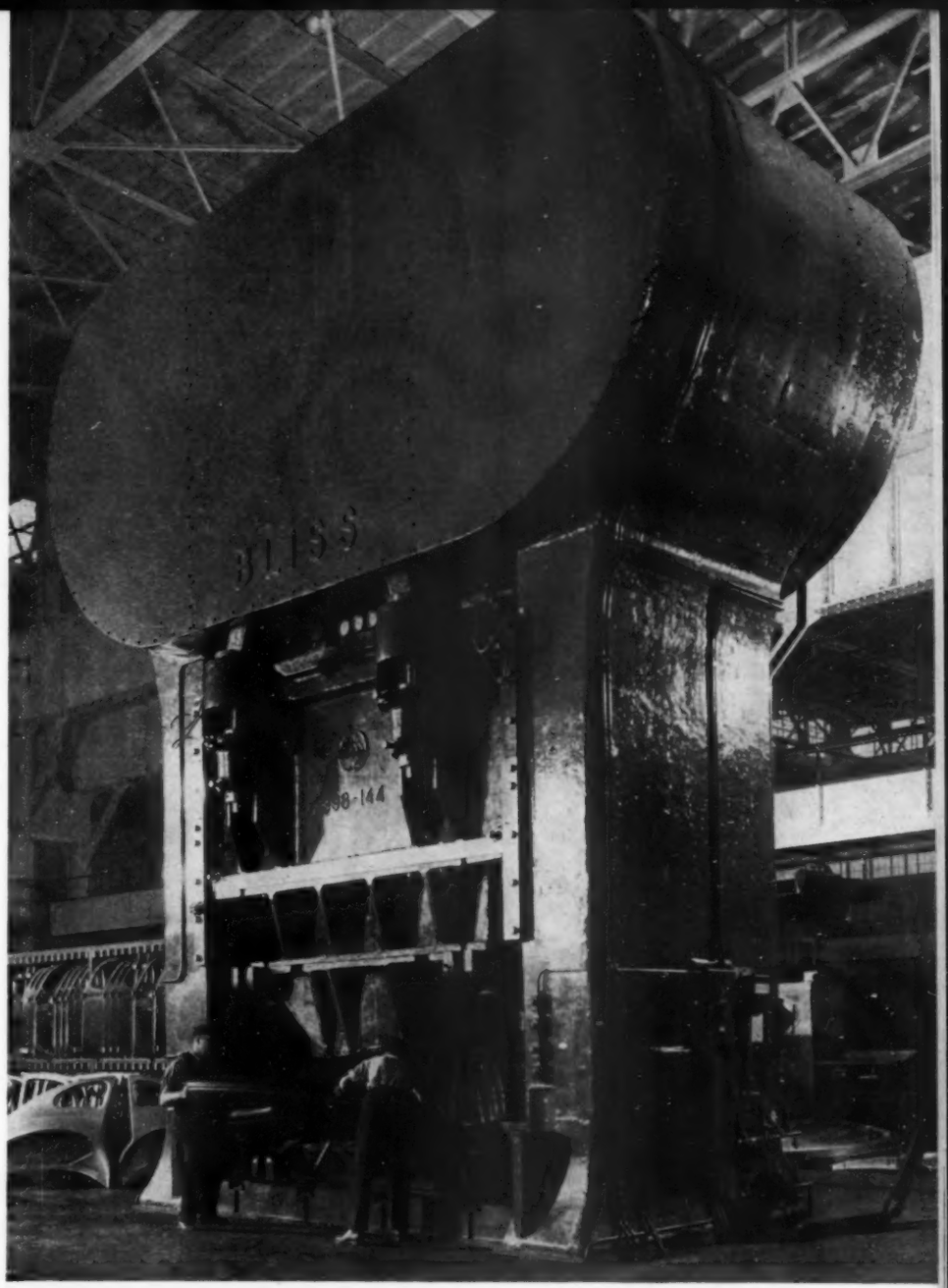
*Heavy sub-structures in the basement of the press shop rest on reinforced foundations and support the large presses*

cast I-beam sections ranging in height from 6 to 24 in. The higher I-beams are used for assembly of the smaller dies, in which the die maker may wish to get underneath for assembly of screws and cushions.

The centralized heat-treating department in the tool and die shop resembles a huge finely kept bake shop or enamel department. All furnaces are inclosed behind a great continuous cabinet of non-rusting black steel bound in stainless steel trim. All quenching tanks are likewise housed in cabinets. The floor is yellow brick laid in sand. Instrument panels for furnace control are flush with the cabinets of which there are two.

The press shop is an L-shaped building in which the main portion measures 1,660 ft. long by 392 ft. wide, and an L that is 664 ft. long by 240 ft. wide. Total floor space is approximately 810,000 sq. ft. on the main manufacturing floor.

Outwardly the press shop gives the appearance of a four-story building. However, it contains only two floors, a main manufacturing floor above and an above-ground basement below. The latter is principally used for the huge cast-steel sub-bases of the presses, the electrical substation with its myriad transformers, and a few presses making small parts.



*Extending almost to the craneways, a line of presses such as this is devoted to the stamping of body panels*

*In the tool and die shop, modern portable tools give finishing touches to a radiator grille draw die*

Convenience in rearrangement of presses, should product changes demand it, is the reason for the two-floor construction of the press shop. If a press is to be shifted, the cedar block and floor plates will be taken up at the new location, and the overhead cranes will pick up the complete press and place it on the cast steel sub-bases already in place below the opening. There are three 90-ton cranes in the building for this purpose. These cranes have a 95-ft. span and a lift of over 54 ft., which is sufficient to clear the largest presses in the shop.

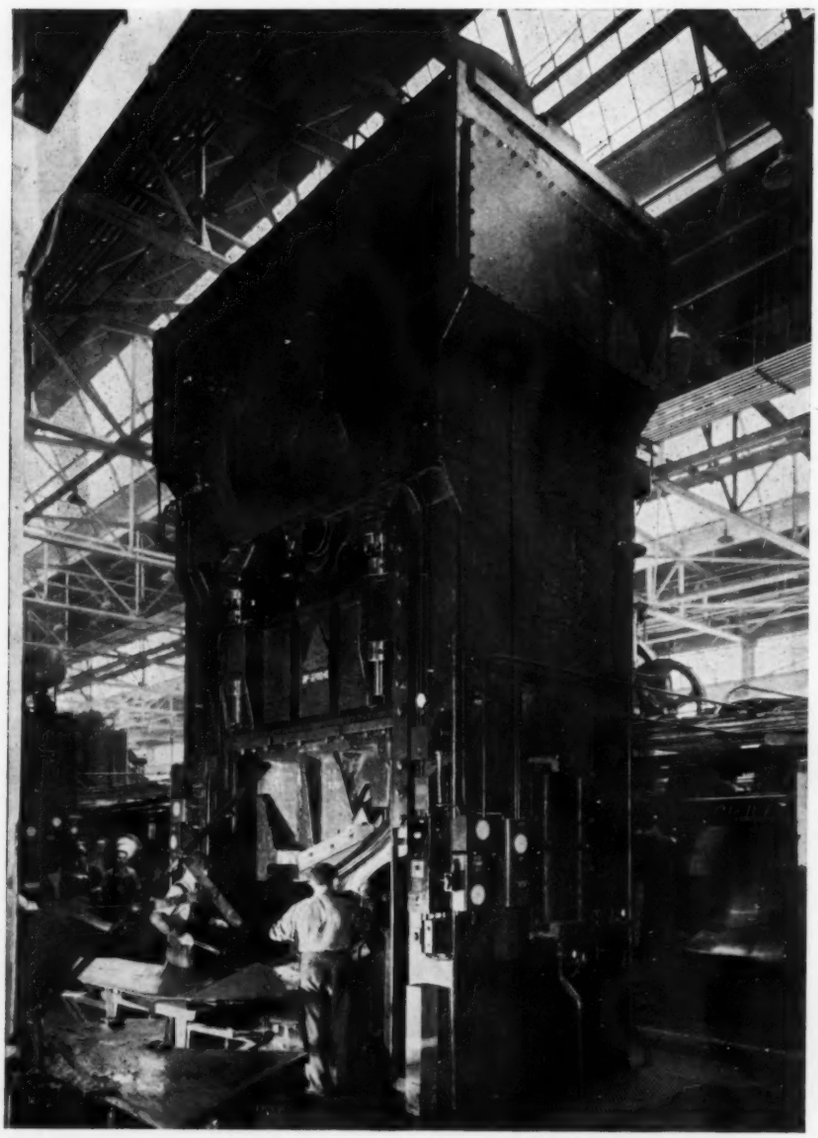
The sub-bases extend from the reinforced basement floor, which is supported by the H-beam piling, to the first floor ceiling. Each base has means to bolt and cradle the press bottom.

Most of the new blanking presses

for the major press lines are now fitted with automatic blank unloaders. A flying grate, held at the ends by flexible links, oscillates to and fro between the dies. As the punch goes up, push-off pins place a blank on the grate. On the return stroke, the grate delivers the blank to a stack and clears the dies for the next press stroke. This blank unloader is new to the automotive industry and it affords operator safety and speed of operation.

Heavy fender presses are grouped at the end of the L adjacent to steel storage, which is fed continuously by the rolling mill. A battery of 1,000-ton machines, two Clearings and two Blisses, draw 1,200 rear fenders a day, rights on two machines and lefts on the other two. Each pair of machines is served by a blanking press and blank oiler. Blanks are stacked upon removal from the oiler right in position to be put into the draw dies. After drawing, the fenders are hung on a conveyor for a trip through a soap and water spray chamber to remove drawing lubricant. Each fender press has back of it a string of smaller presses and welders for trimming, piercing bolt holes, and spot welding reinforcing strips. Completed fenders are hung on a conveyor that runs between the fender and the front grill stamping departments.

Body side panels and steel tops are produced in another line of machines that extend along the side of the L and the end of the main portion of the press shop. Behind each of the blanking presses and drawing presses for the larger body pieces, there are additional lines of secondary machines for succeeding operations. Small machines nestle close to the huge units for the purpose of making small parts from the scrap with minimum handling and movement.



*Plenty of work space is allowed around this 1000-ton press which is one of a battery installed for drawing fenders*

Gas tanks made of terne plate are being seam welded on a new production line. First the two halves are spot welded together. Then the partial assembly is loaded into two opposed seam welders for the seams on the two longer edges. Once the work is started the tank passes right through to the third operation. Here an operator guides the seam welding of the ends and rounded corners. Water is now sprayed on the seam welding rolls because it prevents them or the weld from burning; the speed gain is 4 to 5 in. per min.

Gas tanks then go to a water test. They are carried by a conveyor which dips into a 40x20 ft. trough, makes a U-turn and lifts them out again. Special clamping fixtures are connected in series by pieces of air hose and in turn transmit air press to the tanks which they carry. Bubbles rising to the surface enable inspectors to spot leaky tanks.

Other parts such as doors, brackets and the great number of stamped parts going into the modern all-steel automobile are produced in further press set-ups.

Through this maze of equipment wind seemingly endless miles of conveyors. The shipping conveyor is more than four miles long. This conveyor winds up at the shipping dock, which is a four-track, inclosed and heated department. Cars with specially fitted racks will take as many as 300 steel tops plus a huge quantity of smaller parts to branch assembly plants.

The maintenance toolroom in the press shop makes new dies as well as repairing and dressing tools from regular production. Two new large Keller die-sinking machines, several large planers and radial drills provide facilities to handle a steel top and side panel dies. Large bulky tools are taken directly to these machines by the overhead cranes, while smaller tools are transported to the small machine and bench section.

Down the center aisle of the bench section there is a line of drilling machines and grinders to serve the men working at rows of benches running at right angles to the main aisle. These machines are grouted into a concrete strip flush with the adjacent cedar block floor.

The new press shop is amply equipped with comfort facilities for the workers, including shower baths.

# Everything Above Board

**Middle-western company, dominant in its community, adopts policy of telling its story factually and boldly to townspeople and of giving valuable aid to local newspapers**

GOOD PUBLIC relations start at home. If a company's relations with its own employees are all right and if its standing in its own community is high, its biggest job of public relations is well done.

It is on such a premise that one company in a Middle Western city of 200,000 population has proceeded with notable success. This company went through the 1937 strike epidemic without losing an hour's work throughout its entire organization on account of work stoppage. This was not an accidental achievement; contributing to it was a well-planned, well-executed program of public relations.

It so happens that this company occupies almost a dominant position industrially in its city. Yet a year or two ago even the city's merchants were saying that the city would have been better off if this company had not located there. Such was the prejudice which had to be broken down.

The company went at the task systematically. It built up a factual case regarding its employment in the community, its payrolls, its tax payments, the amount of money its workers spend with local merchants. It did even a better job than hoped for. The first presentation of its data was at a dinner at a local country club to which all of the leading merchants and civic officials had been invited.

The guests were enthusiastic about the presentation. They had had no idea that the company meant so much to them and to their neighbors.

On the spur of the moment a leading department store executive asked whether the company's spokesman would tell the same story to all of his 900 employees if he would get them together some evening. The company replied "yes" and about ten days later the meeting was held. Other meetings of interested groups followed until the citizens of that community had absorbed all the facts relating to the company's contribution to the city's economic and social life.

*. . . word went around that the company was importing "hillbillies" from an adjoining state*

But that was only a beginning. The same fact-finding approach was made to many other subjects. The company is in mass production of certain articles, and the management knows that much propaganda is being directed against the machine. If industry weren't mechanized, say the critics, everything would be fine. There would be no unemployment. All our ills would be miraculously cured overnight. The company set out methodically to tell the people the true story of the machine.

An executive who is an able speaker took on the job of educating the people. He spoke on the machine and its contribution to our economic life before many groups. Some of the groups were company employees, others were civic luncheon clubs, still others were women's organizations. He even invaded the headquarters of the AFL union and got a sympathetic reception. Judged by the responses at the end of the meetings, the campaign accomplished much good.

The same technique is being used to bring other subjects to the attention of the townspeople.

In the company's magazine for employees the same frank treatment is found. On the magazine's editorial page has been appearing a series of articles on highly controversial subjects. To illustrate: one subject recently treated was "big business." The article points out that "the greatest human progress attaches to those places and times wherein bigness, operating under the law of legitimate

competition, has been allowed to exist. Within those fields where it applies, bigness brings out the fullest measure of results from natural resources and human talent, and competition in turn brings out the fullest measure of the possibilities inherent in bigness itself. . . . Men need not fear big companies so long as they exist in the plural. Danger lies largely in singleness of control, whether through private ownership or government ownership."

About two years ago word went around town that the company was importing "hill-billies" from an adjoining State to replace local workers. As the story was passed from one person to another its misinformation grew. The company proceeded to make an exhaustive study of its records to find out where its workers lived and where they came from and how long they had been employed by the company.

The results knocked the "hill-billy" story in the head. It was proved that not more than a small handful of employees had come from the adjoining State, that an overwhelming majority were natives of the city itself or of the county in which the city was located. The dissemination of this information was one more way of eliminating a source of friction between employees and the management.

The company's affairs are an open book to the newspapers of the city. The public relations man of the company knows intimately every newspaper editor and knows by name every member of the editorial staffs. The newspapermen know 24 hours a day where the public relations man or one of his representatives can be found. If anything happens in the factory, such as a fire or an accident, which is newsworthy from the standpoint of the newspapers, the factory departmental heads have been trained to phone the public relations office which in turn notifies the newspaper offices. In a majority of cases the newspapermen learn about happenings at the company's plants through the public relations office before they have had time to hear of them from police or fire departments or other public agencies.

Whenever any difficulties or policy matters arise, the company's attitude toward the newspapers is one of complete frankness. The editors are personally told all the facts, and if for any reason the company desires no publicity, the arguments are presented along with the facts and the decision is left entirely to the editors. If the editors think the facts should be published anyway, the company bows to their decision. Obviously such a policy builds with the local press an invaluable friendship and trust.

But obviously all the fine relationships with outsiders would mean less than nothing if the company's treatment of its own employees was not all right. Actually, the company has spent large sums on equipment for the comfort and safety of its workers. Its factories are of modern construction, with plenty of daylight, adequate space between machines, latest designed lights for night work, proper ventilation. The company has provided clean cafeterias with good food, lockers and washstands, sanitary toilets. Not many things have been overlooked to make the plant a more attractive place in which to work.

Foremen are given courses which will make them more intelligent spokesmen for the management in dealings with the men. New employees are told frankly about the company's policies on employee relations so that there will be no misconceptions grow up. What is all-important, wage rates are the highest in the city and working hours are well within the legally prescribed limits.

With such a program within and without, the company has been able to maintain an enviable record, and the chances are that the record won't soon be marred.

# Machine Shop Training

By SAMUEL GAHAN
*Murray Hill School*

IF WE are to make a success of industrial education we must have a clear understanding as to what we shall teach. Is it possible to teach a whole trade in the 2,400 shop-hours of our four-year course? If not, how much shall we attempt? What branches shall we teach? How much time shall we give to shop theory. How much to the study of manufacturing methods, and to the study of the work of closely related shops? Shall we compete with other methods of training, such as the apprenticeship system and employers' trade schools, or shall we cooperate with them? If we wish to cooperate, how shall we?

The customary length of the apprenticeship course is four years. In my time, that meant between 11,500 and 12,000 hours of actual shop work. The theoretical and related knowledge had to be acquired elsewhere. At the present time the four-year course consists of about 8,000 hours of which from 400 to 600 are spent in the classrooms. Even with this shorter course. I believe a better grade of mechanics is being turned out than in the old days, chiefly because most shops now require an apprentice to have a high school education to start with, and then give him a more intensive training under instructors trained for that work. In the old days, an apprentice was expected to pick up most of his trade watching and assisting experienced workmen. As the tendency is toward a still shorter working day, one wonders just how long it should take, under the best possible conditions, to train a boy to hold a job.

The purpose of vocational education is to fit the pupil for useful employment in some specific trade or occupation. Industrial education is but one division of vocational education. The shop teachers for this work are taken from the industries. They are men and women who have previously earned their living working at the trades they are now teaching. The Federal Board for Vocational Education has said "vocational education concerns itself with preparation of youth for immediate self support" —"Vocation education is intended for individuals who have made definite vocational choices and for such individuals only—A clear understanding that this determination of aim is an essential prerequisite to effective vocational training of an individual would clear up much confusion which now exists as a result of the use of the term 'vocational' to describe certain subjects of study such as manual training, mechanical drawing, shop work, when pursued by those who have not yet selected a vocation."

Have school authorities learned much from a quarter century's experience? Do they yet clearly understand the difference between the teaching methods that should be used in the shops and those in the classroom? If they do, then, why are trade teachers urged to take courses in teaching from people who have never attempted to learn a trade, much less earn their living working at one?

Abstracted from a paper presented before the annual conference of The Vocational High Schools of the City of New York.

# Layout for Job-Welding

## Equipment for a profitable job welding shop can be added as the needs of the business grow

HOWARD McCORD and FERD H. DREWES
*W. G. Jarrell Machine Company*

NATURALLY, the extent and arrangement of equipment in a commercial or job welding shop must be consistent with budget limitations. Existing buildings and facilities often must be adapted to the requirements of the shop and, at the start, it is perfectly feasible to install only one piece of equipment in each of the departments and still have a well balanced shop. Material handling facilities must be adequate if profits are to be realized; material handling methods of 1920 cannot compete in the 1938 market.

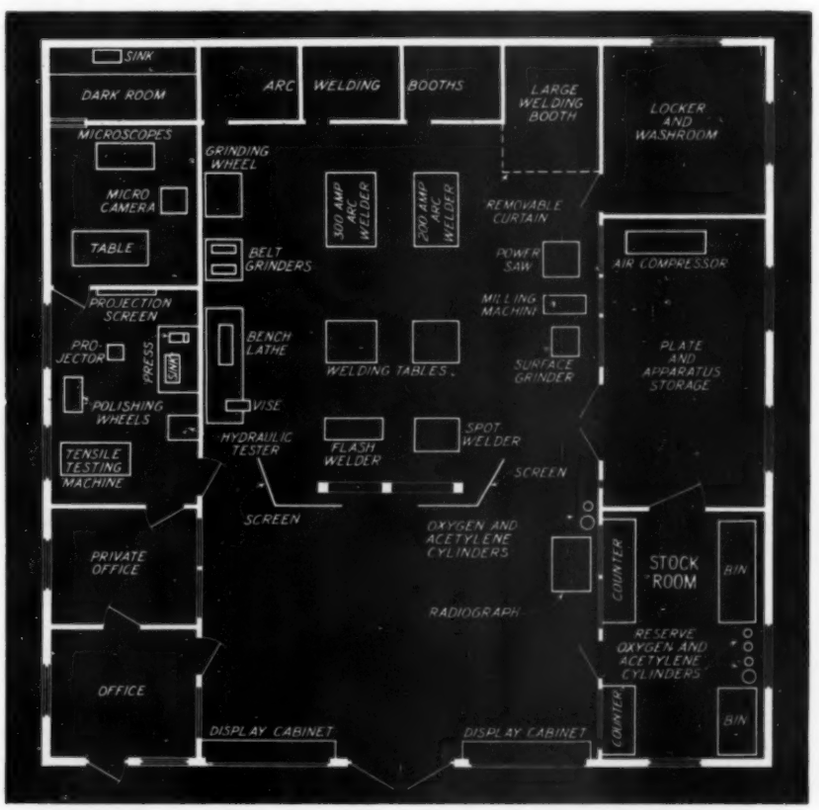
The model arc-welding shop for which a layout is shown has been planned for profitable operation on a fairly wide range of electric arc and oxyacetylene welding jobs. The equipment for testing welds provides facilities for a constant check on weld qualities and the efficiency of the individual welders.

In the model shop shown, the 300-amp. arc welder is a gasoline-engine driven unit mounted on a trailer so that it can be taken out of the shop for on-the-job welding. The flash and spot welders should be selected for wide adaptability, unless contracts for individual jobs justify the purchase of special-purpose units. These units need not be installed at the start, but once set up will find many uses.

Experience has shown that the following sizes of plate stock should be carried in the storeroom: $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, $1\frac{3}{4}$, 2, $2\frac{1}{4}$, $2\frac{1}{2}$, $2\frac{3}{4}$, 3, $3\frac{1}{2}$, 4, $4\frac{1}{2}$, 5, $5\frac{1}{2}$, 6, $6\frac{1}{2}$, and $8\frac{1}{2}$ in. Round bars should be available in the following diameters: $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, $1\frac{3}{4}$, 2, $2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4, 6, 9, 12, 14 and 16 in. The stock also should include standard channels, I-beams and angles, as well as the necessary supply of different sizes and grades of welding rods, electrode holders, goggles, gauntlets, shields, fireproof curtains, torches and hose.

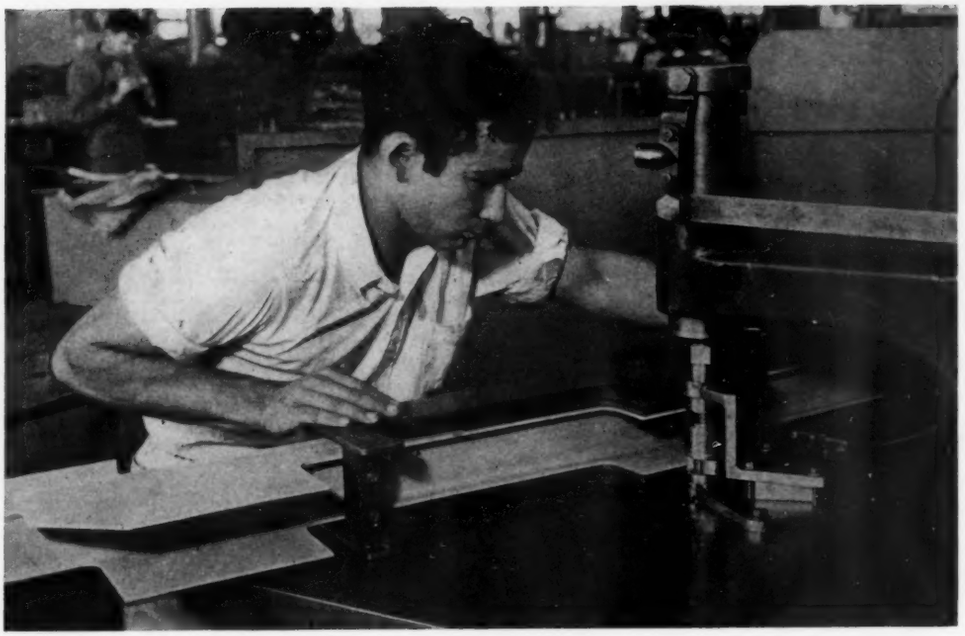
In organizing a commercial welding shop one of the essentials is the selection and training of the welders. The applicant should be familiar with the operation and adjustment of the equipment in use in the shop and must be thoroughly grounded in the fundamentals of arc welding. Demonstrations of ability should be demanded of each applicant. Manufacturers of welding equipment and electrodes furnish the purchaser with literature giving recommended applications and procedures that will guide the proprietor.

Each job should be checked carefully and the data compiled and made available for consultation once a week for the purpose of noting the progress of the new employee in such matters as welding speed and pounds of electrodes used per foot of weld. Discussions at a weekly meeting, with employer and employee alike offering suggestions, will result in each having a clearer understanding of each other's problems.




*The equipment selected for the model commercial welding shop provides for oxacetylene as well as electric-arc welding and includes sufficient machine tool equipment to handle almost any work offered. Weld testing equipment insures continued maintenance of quality in the work done*

Briefed from the paper which received the first main award of $3,765 in the Commercial Welding Classification of the contest sponsored in 1938 by the J. F. Lincoln Arc Welding Foundation.



*Flanges for the Vultee center-section wing spar are extruded sections routed to the desired profile on a profiling machine adapted from standard woodworking equipment*

# Machines For Aircraft

## Profiling, forming and assembling of parts are speeded by the application of improved machines, production jigs and special units

By DON I. CARROLL
*Plant Manager, Vultee Aircraft*
*Division of Aviation Manufacturing Corporation*

MACHINE processing operations in the Vultee plant are rather sharply divided between the machine shop proper and all other applications of machinery to airplane building. The latter are frequently novel or highly specialized; standard machine tool applications were discussed in a previous article (*AM*—Vol. 83, page 40). For convenience special aircraft machine equipment can be subdivided into three general classes. The first is profiling equipment, which is used for cutting sheet metal or extrusions accurately to a predetermined pattern. The second, forming equipment such as presses, drop hammers and power brakes, is used for shaping sheet metal into various, and often quite complex, forms. Finally, there is the assembly equipment, which includes special production jigs, special riveting machines and electric-welding machines for seam and shot welding.

There has been some progress in the application of machinery to assembly, or fastening, operations, but this field offers considerable promise for further mechanization. Assembly operations are now the bottle-neck of aircraft manufacturing technique. We have already streamlined our various forming and processing operations through greater dependence on the machine shop, drop-hammer and press shop and profiling shop, but when we start fastening together the various pieces, parts, and sub-assemblies of an airplane we become involved in much expensive hand work.

Riveting is at present the leading fastening method; however, the shot-weld process is finding increasing application. Also increasing use of various types of bolts or screws, such as the new Phillips recessed-head screws, is helping speed production.

We have sub-divided the riveting process to achieve production economy. A high-speed riveting machine is used on all small assemblies where a large proportion of the riveting is of the straight-line type. By use of special jigs we can run assemblies through this automatic riveting machine and punch holes, insert and fasten rivets all in one operation at high speed. Where riveting is done on large assemblies or in inaccessible locations we use various types of power riveters, mostly of the portable pneumatic type. For large rivets we used a hydraulic riveter.

On many non-structural parts, such as fuel tanks, or seats, we use electric welding. This process is also widely used wherever we employ stainless steel, which is an ideal material for assembly by the shot-weld process.

### Use of Welding Widens

Shot welding, or seam welding, is finding increasing use. Further application of this process rests with the airplane designer to a large extent, but also depends somewhat on further refinement of shot welding technique, especially in connection with fastening light alloy materials.

In our forming shops we have employed the power brake, hydraulic press, punch press, drop hammer, and other such equipment for the

*Presses and drop hammers make possible the production of double-curvature sheet-metal parts that otherwise would be too expensive to use. Rubber mats, shown in the foreground, are used for coaxing the sheet material into the die before the final hammer blow is struck*

economical manufacture of complex sheet-metal parts. The power brake is used for forming angles and various types of straight sections from flat sheet material. The hydraulic press has found wide application in the aviation industry and is invaluable for forming very large sheet parts, as well as many different small parts in a single set-up. We use the hydraulic press for forming, flanging, and shearing in one operation, as on wing ribs. The toggle press is a mechanical variation of the hydraulic press. This tool is now being used by North American Aviation and may find application elsewhere. Its basic advantage is high-speed operation for certain types of pressing. The punch press, used largely for blanking operations on parts not greater than 12 in. across, is gaining popularity in connection with the Continental die process. The Continental dies are produced with the Do-All machine, cutting flat dies from cold-rolled boiler plate of $\frac{1}{2}$ or $\frac{3}{4}$ in. thickness. By this process it is possible to produce a die and punch quickly with little hand work. The punch is carburized and the set-up is extremely simple. Cost of this method is about one-third that of normal die costs and the work is entirely satisfactory for limited production runs. Piercing and blanking operations are largely performed with the punch press, although many simple forming operations are also done.

The drop hammer is in some respects our most versatile forming tool, making possible the production of some parts which could hardly be manufactured by any other process. The presses and drop hammer together make it possible to use double-curvature sheet-material parts that would otherwise be too expensive; thus, they contribute to the aerodynamic efficiency of the airplane as well as to economy of production.

Machine men generally are familiar with the new aircraft drop-hammer technique, which employs zinc and lead dies in connection with a free-fall hammer to stamp shapes in aluminum-alloy or steel-sheet material. We have contributed our share of improvements to the technique, including use of multiple progressive dies for deep forming operations, rubber blankets or pads for coaxing metal into difficult corners, and many other detailed refinements of the operation. But we believe our greatest contribution to be our application of production methods to the entire drop-hammer process.

### Double-Rope Hammers

Also in the drop-hammer shop proper we have increased production per man hour through design and manufacture of our own hammers. These are characterized by unusually rugged construction, with very heavy cast-iron beds, or anvils, and overhead "hammers." As is customary, we use a rope lift working from an electrically operated friction drum, but for the sake of safety we use a double-rope lift system, and a double system of safety latches. This makes it physically impossible for the hammer to fall unless deliberately dropped at the will of the operator.

Operation of the hammers is made more satisfactory through the design of the support system for both power drum and hammer head. The former is supported on four heavy members widely spaced and mounted in foundations entirely separate from the base of the hammer. The hammer base extends out to give support to heavy vertical arms, rigidly attached to the base, which guide the hammer head in its fall. This construction assures perfect alignment. The hammer base is mounted on a system of timbers which extend down to a sub-surface concrete base. A system of spot lights is mounted on the hammer power-drum support pedestals so as to provide the operator with light sources to reach into all parts of the die or work during stamping operations. Hammer-shop work is further quickened through provision of work layout tables adjacent to the hammers in such a way that the work is accessible with minimum effort both before and after stamping.

One of the major forming problems at Vultee has been the production of circular or oval rings for fuselage stiffeners and other purposes. We could not find any equipment satisfactory for this purpose and finally designed our own machine, which is relatively simple in construction, and extremely efficient in production. The machine consists essentially of a set of two rollers mounted one above the other and driven at variable speed in either direction. Alongside the lower roller are two tilting tables, accurately controllable, to feed the work to a de-

sired curvature. The roller dies may be interchanged on their mounting shafts to provide for a wide variety of channel-shape forming.

With this machine we roll straight channel sections from flat strip sheet stock of aluminum-alloy, or other alloys if desired. These sections may be U, V, L or hat shaped; however, other shapes or variations can also be formed. From these straight channels we roll rings of circular or oval section, or any variation. The machine is also used to roll rings from various extruded sections, or from duralumin tubing.

Another process of even wider application, and of great significance from a production standpoint, is our development of profiling machinery. This equipment helps solve the old problem of how best to cut out complex shapes from sheet stock. We also use the process to excellent advantage in profiling extruded sections to relieve flanges and make cut outs as required. There are two ways now in vogue in aircraft plants for doing profiling, and each has its advantages. One is to use a fixed cutter head mounted on a table, and move the work past the head by hand or mechanical means, using a suitable jig to guide the cutter head. This is the method which we have developed and now use in the Vultee shops. Another method provides for mounting the cutter on a system of swinging arms and moving it along the work, which is held stationary on the table. In either case a high-speed head, either air or electrically driven, is used. This tool is quite similar to the familiar wood router or shaper, except that special cutters are used and the machine must be reinforced for the work of cutting metal parts.

### Profiling a Gun-Ring Mount

A good example of the application of profiling to a precision machine operation is that of taking the outside circle diameter cut on the extruded section gun-ring mount. This part comes to us as flat extruded stock of approximately 1-beam cross section. We roll the flat stock into a segment of a circle and then mount it in a special fixture on the profiling table and pull the work past the cutting head by means of a hand-operated drum and cable. The result is a circle diameter cut held to within 0.002 in.

This part then goes on to the machine shop for milling and drilling operations which have been described previously (*AM*—Vol. 83, page 42). The same part, if machined in a lathe, would require an unusually large swing. Also, we cut lathe time, under the best of conditions, by at least 50 per cent. The machine used is adapted from a Union wood shaper with a 48-in. table top and a vertical spindle for the cutter, which rotates at 11,400 rpm. electrically driven. A 1-in. cutter head with two edges is used.

*Cable stretching is an important factor in aircraft building; this machine, designed and built at the Vultee shops, initially stretches the cables by maintaining a predetermined load while they are lengthening under strain*

A high-speed profiling table is used for finer work, the top of which measures 3x5 ft. and has an air-driven cutter head operating at speeds up to 22,000 r.p.m. One-piece tool heads with a diameter of ½ in. or even less, are used. This machine was designed and built in the Vultee plant.

The usual jig used for profiling is made of wood and Masonite, or metal and Masonite, the Masonite being cut to exact shape and bearing against a live or dead collar around the base of the cutter head, depending on the set-up. An example of this is found in the profiling of the heavy center-section spar caps, which consist of deep channel extrusions The side flanges of this part are relieved deeply throughout much of the length of the cap, portions of the flange being left full depth at certain points to form gusset plates of appropriate shape for attachment of the truss members that are later assembled to the cap strips. This work is done with a steel and Masonite jig. The profiler is adapted from a Gallmeyer and Livingston wood shaper, with an auxiliary overhead arm to provide double bearing support for the tool spindle and to assure parallelism of the two edges, or flanges, which are shaped simultaneously.

In feeding the work through the machine, the Masonite guides at both top and bottom of the jig bear on top and bottom dead collars around the cutting tool, supported from an independent bracket bolted to the table top. After the heavy cuts have been taken with this set-up the work is shifted to a second jig and another cut is taken, using a small cutting head of ½ in. diameter, to cut narrow slots in portions of the beam flanges.

For light sheet-metal profiling work a "live" collar is usually used around the cutter head, bearing directly on the Masonite pattern edge of the profile block.

An interesting application of profiling as the long aluminum-alloy gusset plate used to help tie the wing rear beam to the trailing edge ribs and surface sheet material. This

piece is approximately 18 ft. long and of saw-tooth shape varying in width from about 6 to 12 in. As the material is but 0.040 in. thick we had trouble with ordinary profile blocks due to the edges of the material distorting badly under action of the cutting tool. We have solved this problem and at the same time greatly increased the speed of the work through developing a special hardwood profile block about 18 ft. long, and using it in conjunction with an overhead cutting tool.

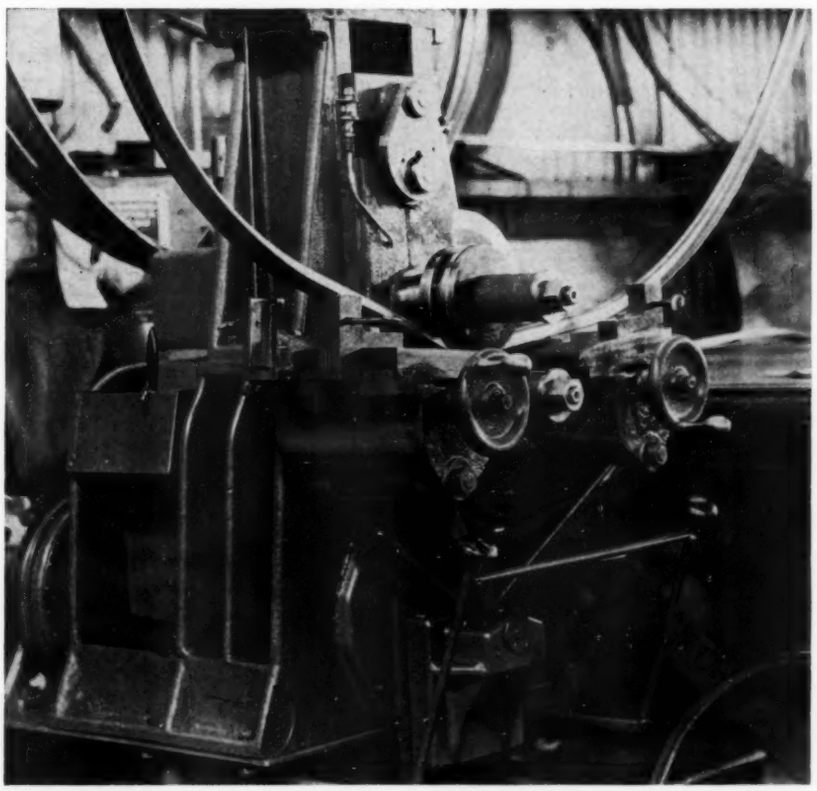
On the upper surface of the block we have mounted numerous locating pins, which fit into rivet holes predrilled in the unshaped gusset stock. In the bottom surface of this block are milled two slots extending the full length of the block. The slots exactly match the pattern of the two edges of the completed gusset plate. In operation these slots fit into a pin in the top of the profiling table. The work is then drawn past the tool, wiggling as it goes to conform with the bottom slots. By drawing it once past the tool in one slot, and once in the other, the gusset plate is profiled accurately on both edges and is then ready for final assembly into the wing structure. In production it is possible to stack these sheets into layers as many as 15 deep and profile them all at once, which is a major item of labor saving, and further assures rigidity of the edges under action of the tool.

As in the case of the drop hammer and ring roller, not all machine-forming operations are cutting operations. One of the more unusual problems that we have solved through design and construction of a special machine, is that of cable stretching. In the manufacture of an airplane, a great many cables are used in the control systems. These are of various lengths and diameters, and all must be spliced to within close tolerances on length.

All steel cables, especially after splicing, have an initial stretch when placed in service; therefore, it is necessary to machine stretch these cables after splicing and before final assembly. But most cable-stretching machines fall short of the required precision loading to assure uniform stretching. The problem, of course, is to maintain a predetermined load during the actual stretching process, while the cables are lengthening under the strain.

This problem was solved by Vultee engineers through use of hydraulic pressure as a power source. An electric motor drives a positive-type hydraulic pump which feeds oil to a piston and cylinder. The pressure developed in the cylinder is transmitted through a lever arm as tension on the cable or cables being stretched. The desired tension on the cable may be held exactly at any desired point from 0 to 6,000 lb. by means of a by-pass valve, which is adjustable through variable tension, and five different relief springs, which may be used for varying load ranges. Thus the stretching of the cable does not all disturb the accuracy of the stretching force as long as the piston does not reach its limit of travel. The cable stretcher has a table 30 ft. in length.

The cable supports are in the form of yokes which permit stretching one, two, or four cables in a simultaneous parallel hookup, and this can be duplicated in series to the length limit of the 30-ft. table. The yokes balance out the load so that to stretch four $\frac{3}{16}$-in. cables, each of which requires a stretching tension of 1,200 lb., it is merely necessary to apply a total stretching force of 4,800 lb., which is evenly distributed over the four cables. Cables normally stretched vary from $\frac{1}{16}$ to $\frac{3}{16}$ in. Stretching tensions used are: $\frac{1}{16}$—200 lb.; $\frac{3}{32}$—250 lb.; $\frac{1}{8}$—600 lb.; $\frac{5}{32}$—900 lb.; and $\frac{3}{16}$—1,200 lb. The cables are kept in the stretcher for 1 hr., after which they are removed and may be installed in the airplane-control system without fear of additional stretch, except for such slight wear as may occur over a long period of service. A $\frac{1}{8}$-in. cable 25 ft. long will stretch approximately $2\frac{1}{2}$ in. in an hour under the 600-lb. load that is applied.



*Rolling a fuselage ring from channel stock of hat-shaped section; the roller, designed and built at the Vultee shops, initially stretches the cables by main-round or odd-shaped rings from formed or extruded channels*

### Cables Stand Overload

In event of cable breakage during stretching a guard is provided above the cables to prevent injury to workmen. However, in a recent demonstration test of the machine we applied over 6,000-lb. pressure to a cable rated at a maximum strength of 4,500 lb., and finally succeeded in breaking the attaching bolt with which the cable was held to the yoke.

From drop hammers to cable stretchers, profiling machines to ring rollers, the aircraft industry has made some strange bedfellows in the machine shop. But we have our own peculiar problems and we have had to solve them in our own way. Some very interesting machines have been evolved. We have made quite a dent in the production-cost curve, and have given quantity-production methods a sizable boost.

# Flat-Edge Trimming

**Square edges on shells of any cross section can be produced with specially built presses and dies having oscillating motion or cam action**

By C. W. HINMAN
*Tool Engineer*
*Kobzy Tool & Electric Mfg. Company*

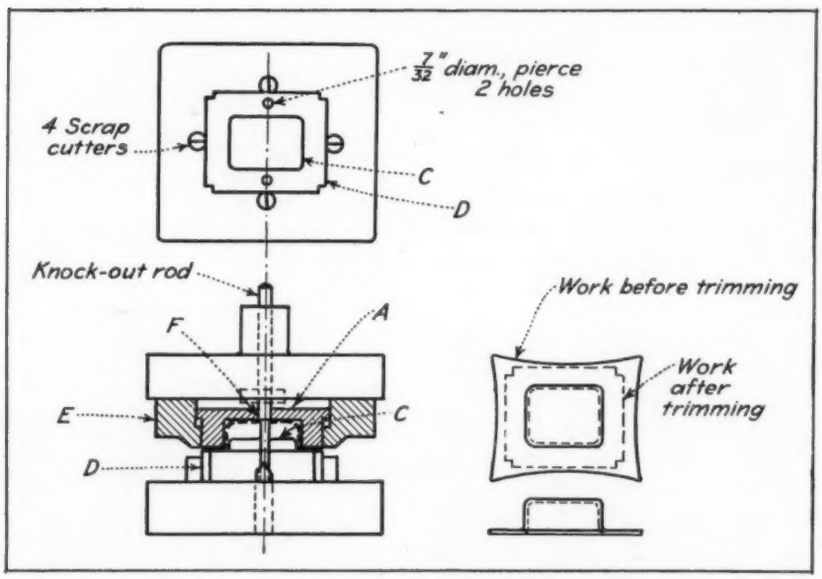



*Fig. 77—A coil cover is accurately located over the pilot plate C for trimming and notching the flange, which is held firmly by the knockout pad A*

METHODS OF trimming circular shells by the "pinch-off" and "balanced-cut" principles were described in a recent installment (*AM*—Vol. 83, page 50). Other principles must be adopted for flat-edge trimming of flanges on rectangularly drawn covers and in the special tooling devised for shells of any cross section.

Tools for trimming the rough-drawn flange on a rectangular cover are shown in Fig. 77. This view shows the cover before and after trimming, as well as the front elevation and plan views of the die. The material is $\frac{3}{64}$-in. deep-drawing steel, and the piece is a coil cover.

In this operation, it was necessary to design an inverted tool in which the die block *E* is mounted on the punch holder above the trimming punch *D* on the die shoe. The reason for this was to dispose easily of the scrap by cutting it into four pieces.

Knockout pad *A*, attached to its rod, is recessed to clear the body of the rectangularly drawn shell on the work, and its face bears directly on the flange surrounding the piece. By these conditions, pad *A* ejects the work without distorting the flange.

The work is placed on the face of the trimming punch *D*, and is accurately located by fitting the shell over the rectangular pilot plate *C*. When the ram descends, the edges of the flange are trimmed, and its four corners are notched as shown by the dashed lines in the sketch of the work. The notches are necessary for the subsequent operation of forming down wings on four sides of the flange. The face of punch *D* is ground ½ deg. from the horizontal to provide for shearing cuts.

In addition to trimming two $\frac{7}{32}$-in. holes are pierced by punches *F*. Four sharp-edged scrap-cutting chisels are located as shown, one on each side of the punch. These cutters divide the rectangular scrap skeleton into four equal pieces, and make it easy to remove them occasionally.

The work having been sheared into the die, it remains there until the upstroke is nearly completed, at which time the work is ejected by the positive knockout rod with its attached pad, as indicated in the illustration. The front elevation is shown at nearly its closed height. The style of die set used is the center-post type.

A feeding chute can be arranged to

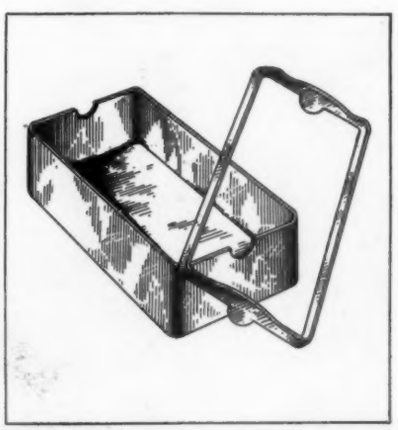


*Fig. 78—Drawn parts with square trimmed edges are necessary when additional parts are assembled thereto by welding or soldering*

slide the untrimmed pieces into the die, and to locate them over the pilot. This would avoid the operator's hand being injured by placing work in the danger zone between the dies.

Drawn shells of any shape—round, square or rectangular—can be trimmed squarely and accurately, or trimmed with notched edges, in a single quick operation by using a Bliss flat-edge trimming press. A trimmed and notched sample of square-edge trimming is sketched in Fig. 78.

The five sketches in Fig. 79 illustrate the die operations necessary for flat-edge trimming. At the left is shown the upper die which carries a filler pad free to float on its surface. The lower die is provided with a spring knock-out pad, and a shell is shown placed on the pad, within the die, ready for trimming.

The punch, as shown, is provided on each side with stop strips that are ground true and parallel with the ground surface of the lower die. Theses strips clear the edges to be trimmed from the shell, when they descend with the punch and stop upon the die. In operation, the filler pad, in descent, enters the shell and depresses it to the required trimming depth in the lower die.

The press slide is cam driven and is designed to dwell at the completion of the down stroke during the trimming interval. A slight motion, sufficient for shearing off the scrap, is then imparted to the *lower* die, which cuts front, back, right and left against the upper die edges. By this action the scrap is sheared off and is ejected by an air blast when the slide ascends and the dies are opened. The side trimming operations are shown in the third and fourth views, Fig. 79, and the end cuts are similarly made. The horizontal slide in the press bed, which imparts the shearing motions to the lower die, is operated from the rear of the press by a vertical shaft driven by miter gears from the main shaft.

The Brehm trimming die, a patented tool, does flat-edge trimming of drawn shells in an ordinary single-action press. The actual shearing off operation is similar in principle to the trimming dies just described under Fig. 79, but the special punch press is not required.

The punch, in descent, enters the shell placed in the lower die, and depresses it to the proper shearing level against a spring pad similarly to the previous examples. Shearing motion is imparted to the lower die by a ridge cut in its sides that contact stationary cam projections in passing them. This peculiar motion, which follows several directions in descent, has led to the popular name: the "shimmy" die.

This die trims, and notches if necessary, all the many varieties and shapes of large or small shells. It is necessary, of course, to build special dies to suit the different sizes of shells to be trimmed, as is the case in all trimming dies. Large work such as the parts for burial vaults, of 0.109-in. sheet, have been rapidly trimmed and notched, 2000 pieces being trimmed and notched in six hours.

Hand tools, called "dinking dies," are extensively used for cutting blanks from paper, cardboard, thin celluloid, soft rubber, felt, leather, thin fiber and soft sheet metals. The sheet to be cut is placed on the end grain of a hard wooden block, and the die is placed over the sheet and is forced to cut the blank by mallet blows on the shank. A hand dinking die is shown in Fig. 80.

Hard rubber, fiber, micarta plate and similar materials are readily cut after heating to a semi-plastic state in a hooded gas oven. For accurate blanks, however, an allowance is necessary for heat expansion and contraction in cooling. While there are fairly accurate formulas for shrinkage allowance, it is best to determine the shrinkage by trial, because much depends upon the grade of the material, and the relation between the surface area and the thickness of the blank.

Dinking dies for cutting heavy materials are provided with a standard punch shank for securing the die in a power press. A shedder plate is fitted loosely within the die with a knockout rod passing vertically through the shank. For cutting multiples of thin blanks in one press stroke, several dinking dies of even heights, are attached closely together on a punch plate affixed to the ram. A shedder within each of the dies is either a spring plate held by stripper screws, or a soft rubber pad cut fully within the die. Interlocking the dies closely avoids wasting the material. This set-up in a press is a dangerous one for the operator's fingers, and should be fully protected.

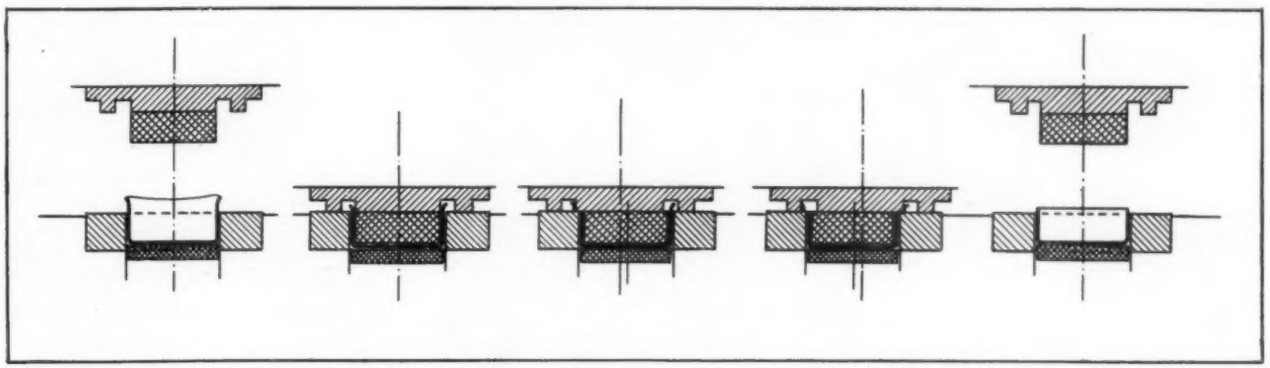


*Fig. 79—In the Bliss flat-edge trimming press, a slide in the bed imparts a sideward shearing motion to the lower die when the tools are closed, thereby shearing off the scrap*

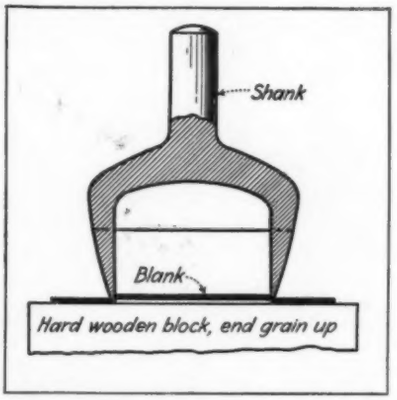


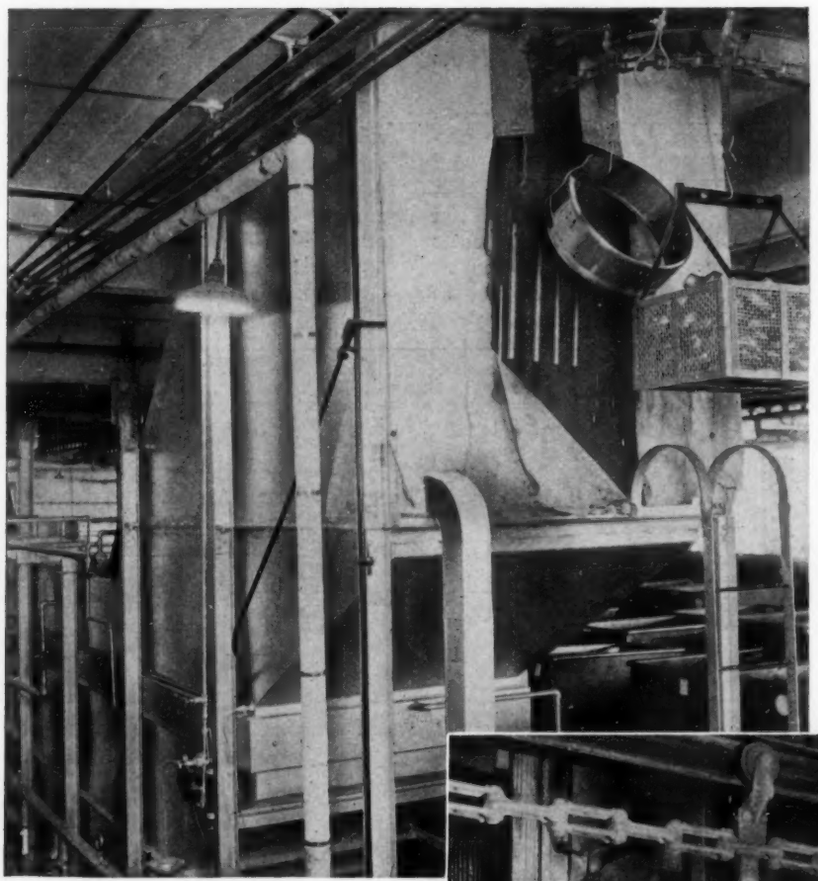

*Fig 80—Dinking dies (the one shown is a hand tool) can be mounted singly or in multiple in power presses for cutting shapes from thin sheets of non-metallic materials and soft metals*

*Part 15 of Mr. Hinman's series will appear in an early number.*

# Finishing First

**An enterprising manufacturer of washing machines gives first consideration to product appearance by installing a brand new set-up to improve it**

By HERBERT CHASE

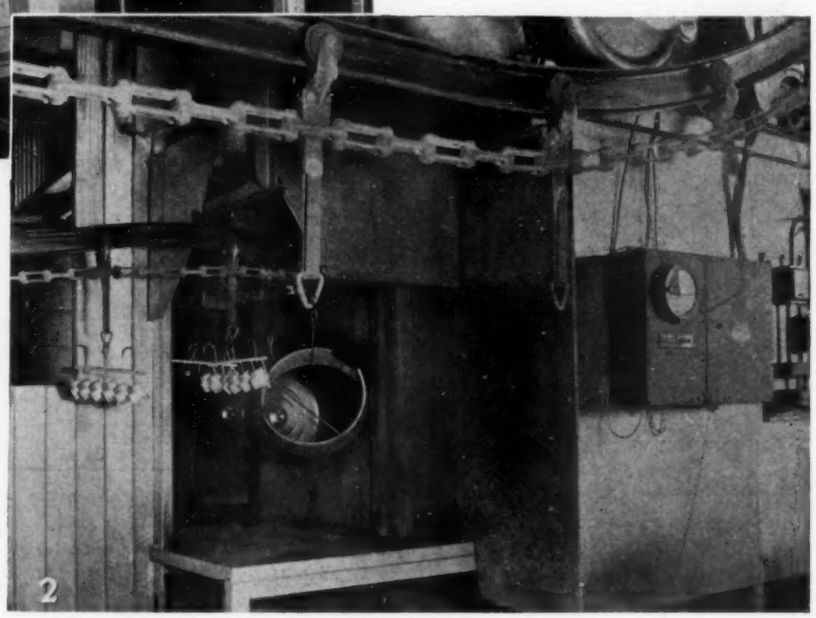


EYE APPEAL is all important in a modern product, particularly if it is something that has to be sold to the consumer. So important did the Easy Washing Machine Corporation regard the necessity of building beauty into its line of household equipment that it recently installed in its plant a fine metal-finishing system.

The washing and ironing machines which Easy manufactures consist largely of sheet steel, zinc-alloy die casings and gray iron sand castings. So far as the visible portions of the machine are concerned, substantially all the parts are put through the same finishing process.

Some portions of the machines are finished partly or completely before sembled before applying the priming coat. These variations make it necessary to tie the finishing process in with other production operations, an arrangement which is greatly facilitated by the use of a chain conveyor which carries parts and sub-assemblies from department to department and often through the actual cleaning and finishing processes.

Although three or four different finishes are used in the Easy plant, one type is applied to a large proportion of the parts and consists of a priming coat of synthetic material, baked on at a high temperature, covered with a finishing coat of white synthetic enamel baked at a somewhat lower temperature. The result is an exceptionally hard and enduring finish, not easily scratched or marred,



with a high wear resistance in normal service. A high luster contributes to the fine appearance of the product.

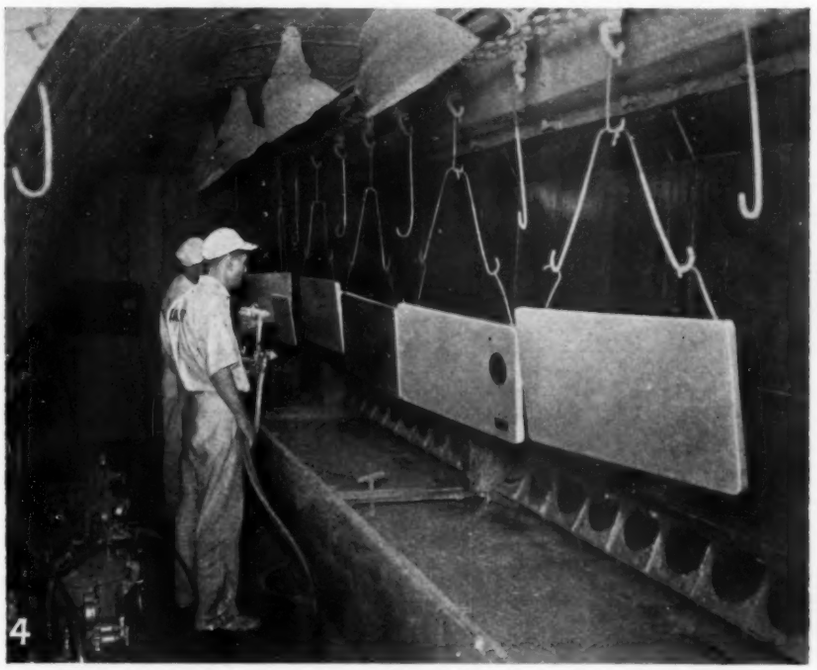
Equipment used by Easy in the important steps of this finishing system is shown in the accompanying picture story.

1 FIRST STEP in the process is to remove all oil, grease and other foreign matter from the part to be finished. This work is done by a standard degreasing unit, using a volatile solvent vaporized by heat and deposited on the parts as they pass through the unit on a chain conveyor. Condensed solvent carries off the soluble material and loosens non-soluble dirt which is also carried off and filtered out. Revaporization of the solvent frees it from oil and grease, permitting repeated reuse and requiring only a slight make-up. Parts emerge from the unit hot and dry

2 STILL ON the chain conveyor, the washing machine parts are carried through a spray Bonderite booth where a light phosphate coating is applied by reaction of the metals with the chemicals employed. This treatment inhibits rust in iron and steel parts, and provides what amounts to an etched surface tending to promote maximum adherence of the subsequent finishing coat. As the process is carried out at an elevated temperature, the parts issue dry

3 PARTS COMING from the Bonderite process are removed from the chain conveyor for priming. Those which receive machine-dipped application of the primer are hung on a bar conveyor; the operators wear gloves to prevent handling marks. The bar conveyor carries a large proportion of all parts through the primer dip tank and thence, after draining, through an A-shaped oven. Speed is so adjusted that the parts take ten minutes in the up leg of the oven during which they are gradually heated to a high baking temperature. In the upper horizontal section of the oven they remain for ten minutes at the elevated temperature and then descend through the down leg, cooling gradually for another ten minutes. Further cooling takes place on the chain conveyor to which the primed parts are transferred to take them to the assembly and subsequent finishing operations

4 SOME PARTS do not lend themselves to dipping, and others require a different finish from the dip priming coat. Such parts go directly from the Bonderite treatment to primer spray booths. These booths are of modern design, have a water curtain for catching excess spray and well regulated downward ventilation. They are equipped with spray guns to apply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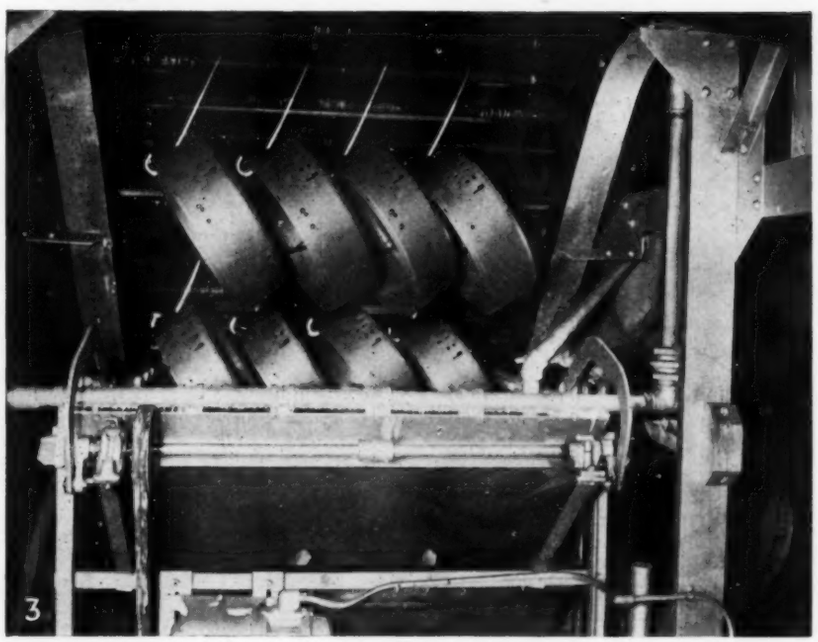
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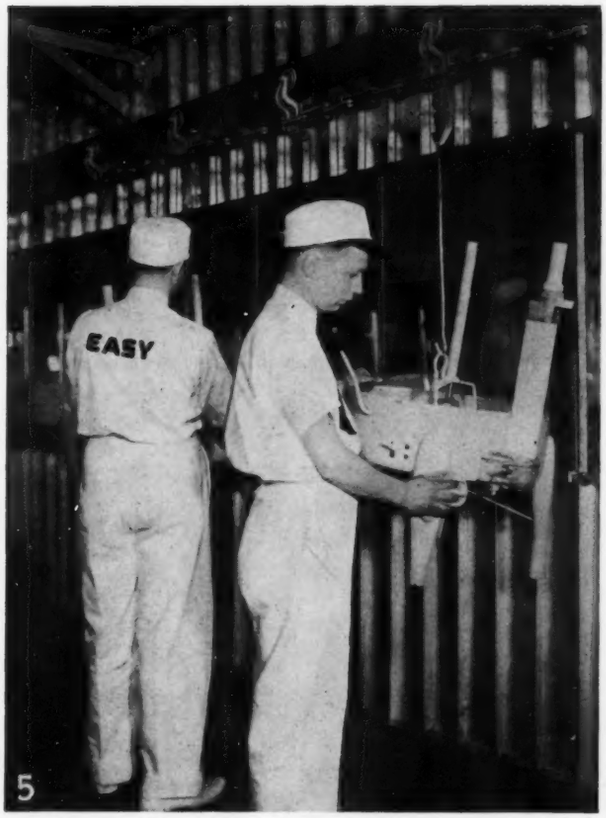
either the regular priming coat, or in the case of partly hidden mechanical parts, a coat of aluminum paint. Parts coming from these booths are hung on the rod conveyor at a point beyond the dip tank and pass through the same baking oven as the dipped parts. The same is true of a small number of parts which are hand dipped.

5 PARTS WHICH undergo assembly or other operations after priming are likely to bear finger marks which must be removed before the final finish coat is applied. Such marks are removed by hand wiping with cloths wet with denatured ethyl acetate; this work is done with the part hanging on the chain conveyor before it enters the final spray booths. The solvent evaporates quickly and does not injure the prime coat but is effective in removing grease or other

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foreign matter which is readily seen against the light colored primer

6 APPLICATION of the finishing enamel coat is done in the latest design spray booths, having one side largely of glass. The spray is directed towards a water curtain which catches the excess for subsequent reclaiming. Specially important is the washing of the air entering the spray booth; when weather conditions require, the air is heated as it enters the top of the booth. The arrangement makes the air dust free and establishes a healthy condition for the spray operators; all spray dust and solvent fumes are drawn off at the bottom so the operators do not even have to wear masks. Two long spray booths, back to back, are operated in parallel. Work is carried forward slowly at a convenient height over a water tank into which the water curtain carries the spray dust. The dust floating on the tank is collected, freed of water and returned to the maker of the finishes for reclamation. Each piece passing through the booth first receives a fog coat at the hands of an operator, and after it partly air dries or sets, receives a final coat similarly sprayed. Parts then enter a horizontal baking oven through which they pass until baking is completed. Cooling occurs as the parts continue along the chain conveyor through the shop to the final assembly bays

7 TO INSURE uniform consistency of the finish used in the sprays a special mixing tank is provided. In this tank the spraying material is diluted and then drawn off into closed containers and transferred as required to the spray booths. There the containers are placed under a pressure of ten pounds per square inch. A 70-lb. pressure is used on the air applied to the spray gun. Temperature in the spray booth is held at 85 F.

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Many a mechanic who has reached 60 is worth more in advising management, in instructing younger men or in ironing out misunderstandings than he is on production.

# Large Wooden Screws

**Made long before the development of the screw-cutting lathe, these large screws called for many hours of painstaking effort**

By FRED H. COLVIN
*Editor Emeritus, American Machinist*

WOODEN screws, not uncommon in small diameters in carpenters' and pattern-makers' clamps, are fast giving way to screws of steel. Large screws of wood, with diameters up to 12 in. and 8 or 10 ft. long, however are relics of days long gone by. Such a screw, found in the Mercer Museum in Doylestown, Pa., is shown in Fig. 1. It was part of an old cider press and is one of several in the museum's collection.

Small-diameter wooden screws usually are cut with a die having special cutters, but these large pieces evidently were chased in a lathe. The method used probably was imported from Europe, as a friend has described for me a similar operation he saw in France many years ago. The essentials of the operation are sketched in Fig. 2.

The piece that is to form the screw is first turned to the proper diameter in the usual manner, using a sharp hand tool guided by a toolrest in front of the revolving wood. Next, a previously cut master screw is mounted between a second set of centers in front of the lathe, as indicated in the sketch, and revolved at the same speed as the piece to be threaded. The formed turning tool rests on the support bar and is fed by hand along the piece at the proper rate by contact with the threads of the master screw in which the lower portion rests.

We have no description of the tapping of the nut, but it was doubtless done by using a single-point tool, or gouge, well supported and fed through the nut by hand at the proper lead.

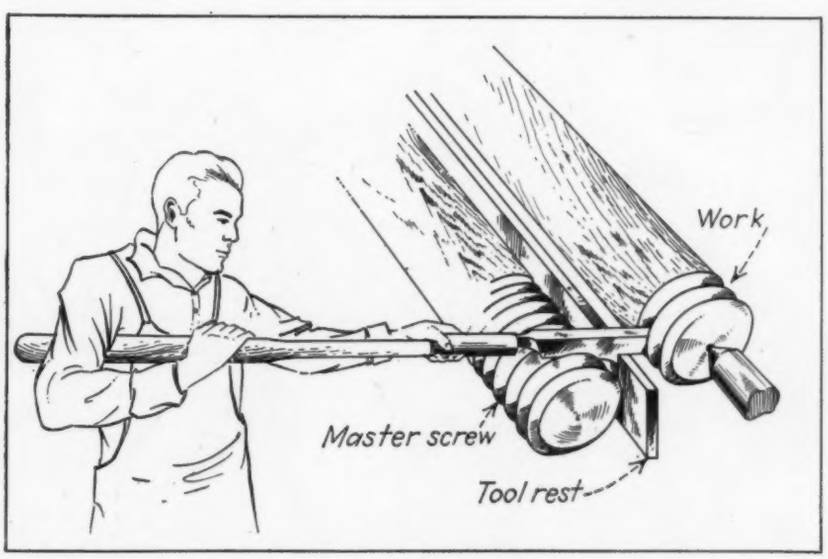



*Fig. 2—Chasing threads with a hand tool, before the development of the thread-cutting lathe, was particularly difficult when diameters were large. Frequently a master screw of the same dimensions was placed in front of the lathe to serve as a guide for the heavy long-handled tool*

*Fig. 1—This wooden relic, found in a museum, originally was used in a cider press. Chasing the threads called for skill of hand that has since been transferred to the machine*

# Railroad Shop Grinding

**Modern high-speed motor power and rolling stock require exact axle, rod and wheel fits now made possible economically with latest grinding machines**

By FRANK C. HUDSON

MACHINE equipment for railroad shops should be considered from several angles. Capital investment, machining costs, the value of time saving on locomotives and cars while in the shop, and accuracy all play their part, and all these factors must be balanced against each other.

The relative importance of these factors may easily vary on different railroads, but there are few cases where accuracy is not important, both as to satisfactory operation and safety. It seems doubtful if this factor is given the consideration it deserves in all cases. This is particularly true on railroads that have introduced the new, high-speed trains where, for example, the concentricity and roundness of wheels is a more important factor than ever before.

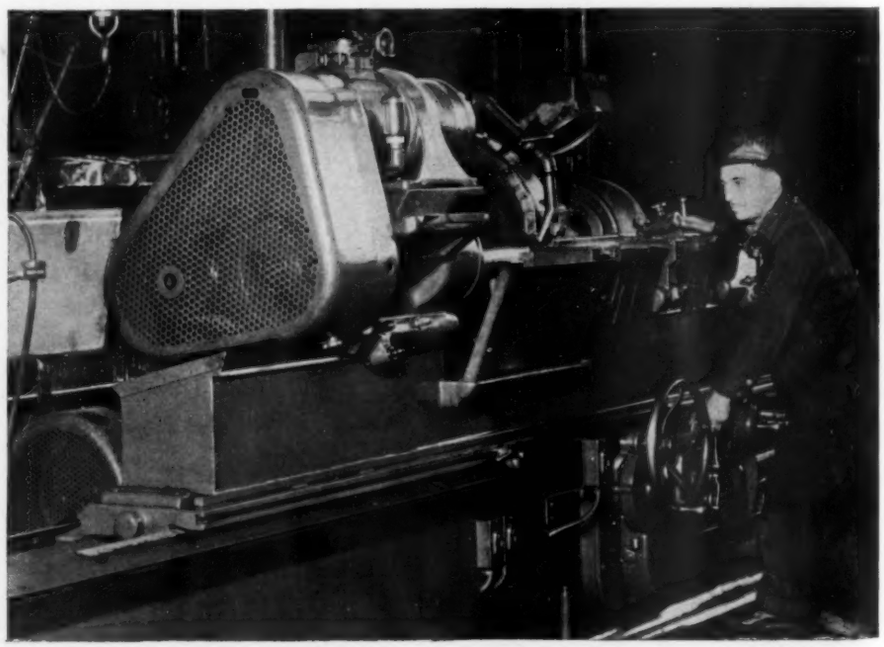
While there are operations on which accuracy is less important than on others, there can be no question as to its value on axle and crankpin bearings, on wheel fits, piston and valve rods, and numerous other parts. Accuracy admittedly plays its part in axle and piston rod breakage. The importance of the former can be judged by the work now being done for the American Railway Association by the Timken Roller Bearing Co. in their testing laboratory at Canton, Ohio.

In too many cases railroad shop executives and mechanics do not have the opportunity of becoming familiar with the latest machine tool equipment that is available, or its application to their work. During the lean years there had been comparatively little opportunity to get new machine equipment even if it were requisitioned. So it is quite natural that shop men have made the best of the tools already available and not been too much concerned about new developments.

Finishing crankpins and axles by rolling is practiced widely in railroad shops in this country and has many advocates. Some of these are thoroughly practical men who are not opposed to other methods simply because they are new. Some of these men admit, however, that rolling or burnishing does not give a surface that is truly round. Variations up to 0.005 in. are mentioned as being common errors on axles of ordinary size. Furthermore, study of a burnished piece shows a deformation of the metal below the surface which materially affects its wearing properties.

While this burnishing action has been shown to increase the fatigue stress of the axle, the lack of roundness on such an axle makes it necessary to finish grind these surfaces after rolling, for the mounting of roller bearing races. This is because the surface on which these races are mounted must be round in order to prevent distortion and in that way interfere with the action of the bearing itself. In the same way it is considered advisable by some to grind the wheel-fit portion of the axle after turning, or after it has been burnished, to increase the fatigue strength recommended as a result of the Timken experiments on axle breakage. Ground wheel fits are being used with excellent results in a few shops in this country and are said to be quite common in European practice.

Grinding machines and grinding methods have not been adopted in railroad shops to the extent that their usefulness and economy warrants, and



*Grinding piston rods in the Salt Lake shops of the Denver & Rio Grande Western Railroad. This Norton machine can handle locomotive piston rods of the largest diameter and will swing a 32-in. piston in the gap, thus making it unnecessary to remove the piston head to regrind the rod*

for several reasons. The early grinding machines were probably not heavy enough for much of the railway work, and the practice of rolling or burnishing is a comparatively simple op-grip among railroad shop men. Burnishing is a comparatively simple operation and can be performed in any heavy lathe. True the use of the single burnishing roll, as is common, puts a great strain on the lathe centers. But when work can be done on machines that are already in the shop, there is a great tendency to defer the purchase of new equipment.

Machines for grinding piston rods and car-wheel treads were among the first of this type to be recognized as essential equipment. The better surface secured as compared with burnishing and the uniformity of diameter obtained greatly increased the life of metallic packings on both piston and valve rods.

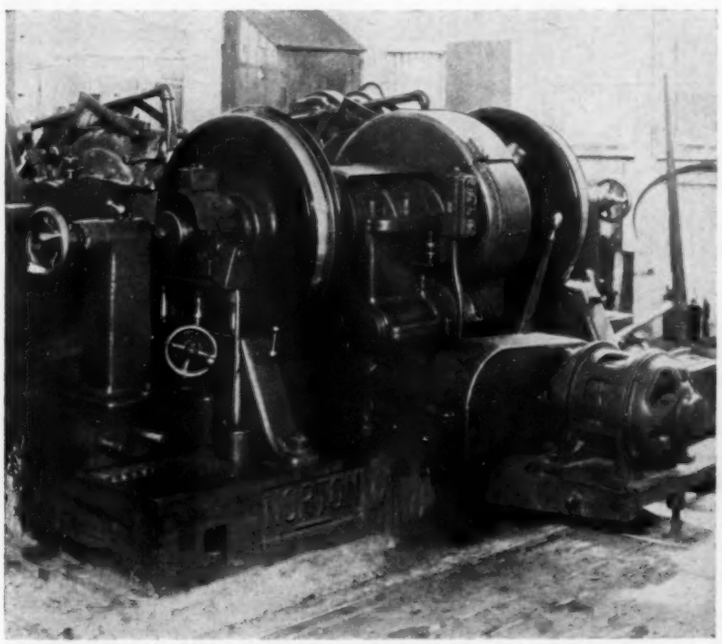
Piston rods are being ground on a Norton machine in the Salt Lake shop of the Denver & Rio Grande Western Railroad. This machine is a 16 x 120-in. capacity unit with a gap to swing 32 in. for regrinding piston rods worn in service without removing the piston head. New 4½-in. rods from 48 to 54 in. long are ground in from 30 to 40 min. The regrinding of worn rods is done in about the same time. The machine has a Norton 46K5B grinding wheel with a 30 x 4-in. face. In this same shop is a Cincinnati 16 x 35 x 120-in. machine for regrinding piston rods without removing the piston heads. This is made possible by casting a gap in the bed of the machine.

Also, in the same shop is a Norton car-wheel grinder, which grinds cast or forged wheels up to 44 in. diameter while they are mounted on their axles. This machine is used both on new wheels and in reclaiming wheels with slid-flat spots. Grinding time runs from 30 to 60 min. per pair, using 16 x 2¾-in. grinding wheels of 16 CN grade. The wheels being ground are driven from the center of the axle and turn on their own axle journals.

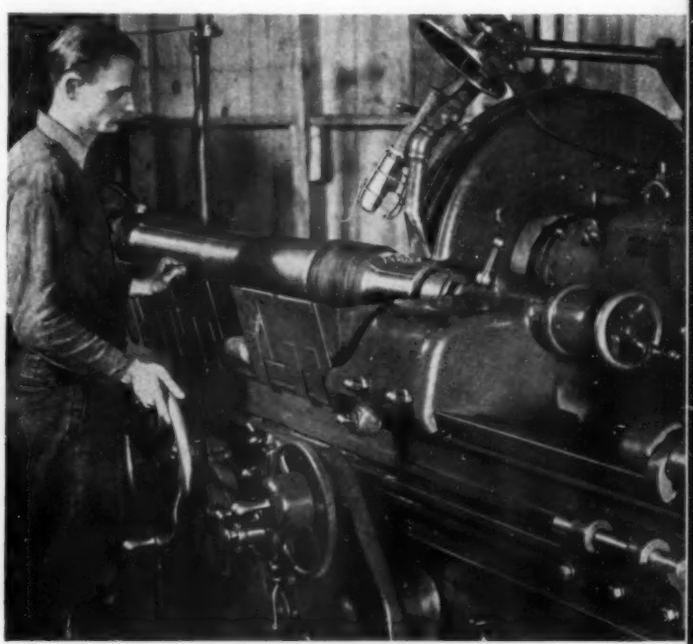
One of the illustrations shows a Norton 12 x 120-in. type C cylindrical machine with a 30 x 3-in. Norton 46L5B wheel for grinding journals and wheel fits. All types of axles are ground, both for plain bearings and to receive the inner races of anti-friction bearings when the axles are equipped for the latter. A standard 6 x 11-in. axle can be ground on the journal bearing, in the dust-collar fit and in buttons or flanges, when the latter are used, in from 20 to 25 min. About $\frac{1}{64}$ in. is left for finish by the turning operation.

With the introduction of solid-end connecting rods, interest began to be shown in grinding machines of the planetary type such as were then being used in large numbers for grinding multiple block cylinder bores. Theses machines were, and still are, used to grind the holes in the rod itself that receives the steel bushing in which the bronze floating bushing revolves. The steel bushing itself is also finish ground and in most cases these bushings are surface hardened by carburizing; therefore, the grinding wheel is the easiest method of securing a round, smooth hole. Where there are regular journal grinders of sufficient capacity to handle these bushings, they can be finished in that way instead of on the planetary machines. The outside of the bushing should also be ground both to secure the proper outside diameter for the press fit in the rod end and also to remove any distortion that might have occurred in heat treating; unless the outer surface of the bushing is round it will be distorted when forced into the rod and in this way affect the roundness of the hole in which the floating bushing rests.

The use of the Walschaert and Baker valve gear, with its numerous linkage bearings, presented another excellent opportunity for the use of both internal and cylindrical grinders for both bushings and pins. While some roads may get along without grinding bushings and pins used in replacement work, it is now common practice to grind theses repair parts to standard sizes, and oversizes, and have them available for immediate use.



*Grinding both wheels at once on a Norton machine, using a 24 x 2¾-in. 16CN wheel. This machine is used to grind wheels up to 44 in. diameter, either on new work or reclaiming wheels with slid-flat spots, in from 30 to 60 min.*



*Since concentricity and roundness of wheel and bearing fits are demanded in modern high-speed equipment, grinding these surfaces produces satisfactory operation and safety of wheels under modern trains*

# IDEAS FROM PRACTICAL MEN

## Taper Pins and Their Application

F. H. MARTIN

Taper pins have the advantage over straight pins in that they can be used again after they have been driven out of their holes. Another advantage is that they can be made to fit the work with any required degree of tightness by the force with which they are driven. Although standard taper pins, both hard and soft, are available, the special pins illustrated are often necessary and justifiable because of their several advantages.

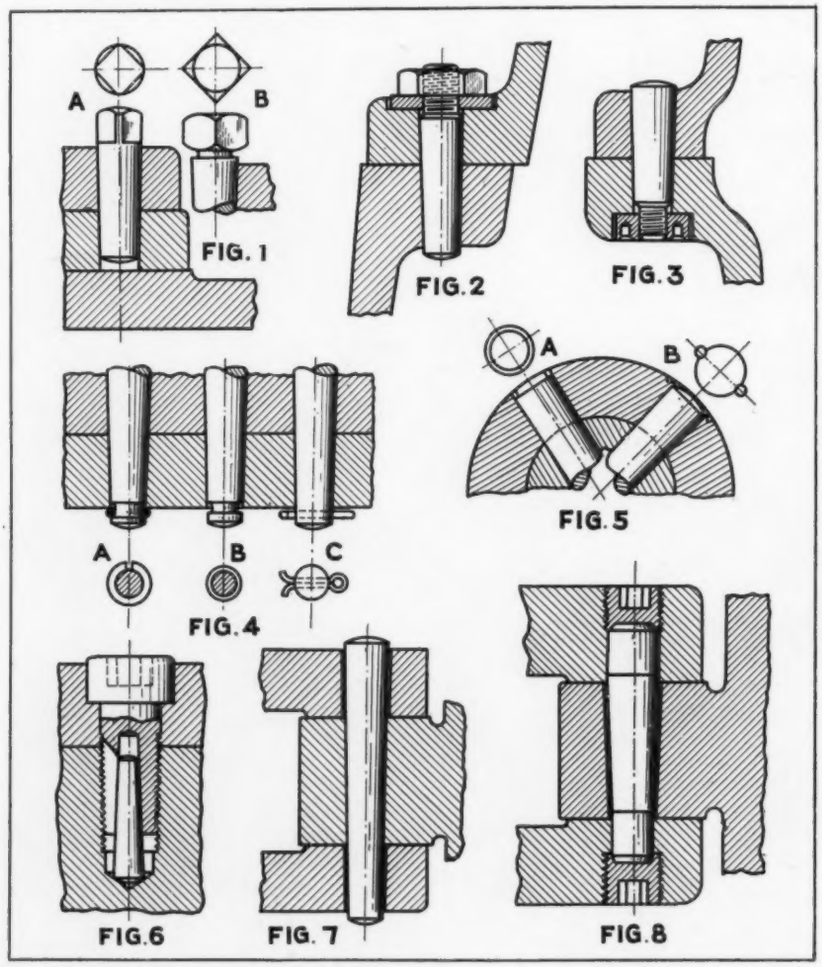
In Fig. 1 at *A* is a standard taper pin having a square milled on its large end so that a wrench can be used to twist it out of a blind hole or a hole that cannot be approached from below. This pin should be made of either S.E.A. 1112 carbon steel or 3135 chrome-nickel and heat-treated. While the square on pin *A* is satisfactory in the larger sizes, in the smaller sizes it is too small to be effective, and the pin at *B* having an enlarged head should be used. This pin should be made of S.A.E. 2512 nickel steel and carburized.

Another pin that can be extracted from a blind or inaccessable hole is shown in Fig. 2. The large end is threaded and is necked at the top to prevent injury to the threads when the pin is struck with a hammer. The threaded end should be cyanide hardened.

Although pins having the usual taper of $\frac{1}{4}$ in. per ft. are self holding, it is sometimes desirable to retain them in their holes by means other than friction alone. In such cases the small end of the pin is threaded and provided with a spanner nut, as in Fig. 3. Both ends of the pin should be cyanide hardened to prevent peening. In Fig. 4 at *A*, *B* and *C* are illustrated other means of retaining taper pins. At *A* a retaining ring is snapped into an annular groove in the small end of the pin. At *B* the metal around the small end of the hole is peened over into an annular groove in the small end of the pin. In driving out the pin the peened metal is sheared off by the small end of the pin at the lower side of the groove. At *C* a crosshole is drilled in the small end of the fin and a cotter pin is inserted.

Taper pins can be retained so that vibration will not shake them loose, as shown in Fig. 5, *A* and *B*. The large end of the pin at *A* is straight necked for about $\frac{1}{16}$ in. from the end. The hole is reamed so that the top of the rounded part of the pin is flush with the outside of the retained member. The edge of the hole is peened over into the space between the neck and the wall of the hole, as shown by the darkened portion at the right of the center line in the end view. The portion at the left of the center line shows the condition before peening. At *B* the top of the rounded end of the pin is also flushed with the outside of the retained member. Dents are made by a prick punch just outside the large diameter of the pin. In both cases the pins can easily be driven out of the holes.

A taper pin can be used to lock a fillisterhead screw, as shown in Fig. 6. An axial hole is drilled and taper reamed in the body of the screw and three lengthwise slits are sawed, 120 deg. apart. When the screw has been driven nearly home, the large end of the pin contacts the bottom of the blind hole, and




*Various applications of taper pins and methods of securing them in and removing them from either blind or open holes are described in the text.*

as the screw is driven home, it is forced over the taper pin and expanded, thus locking it in the hole.

A taper pin can be used for a hinge pivot, as shown in Fig. 7. Both parts of the hinge are drilled and taper reamed when together, and when separated, the two outer lugs are reamed slightly larger, so that when the hinge is assembled the pin will be tight in the central lug and just loose enough in the outer lugs to permit free turning. As wear occurs, the central lug can be slightly rereamed to permit the pin to be driven in farther and take up the looseness.

In Fig. 8 is shown another method of hinge assembly. In this case, however, the central lug is free to turn on the pin. The ends of the pin fitting the two outer lugs are ground straight and are backed up by headless screws in tapped holes in the outer lugs. By adjusting the screws the fit of the taper part of the pin can be made tighter or looser in the central lug.

## Cutting Spacers from Tubing

HOWARD F. MASON
*Engineer, Northern Radio Company*

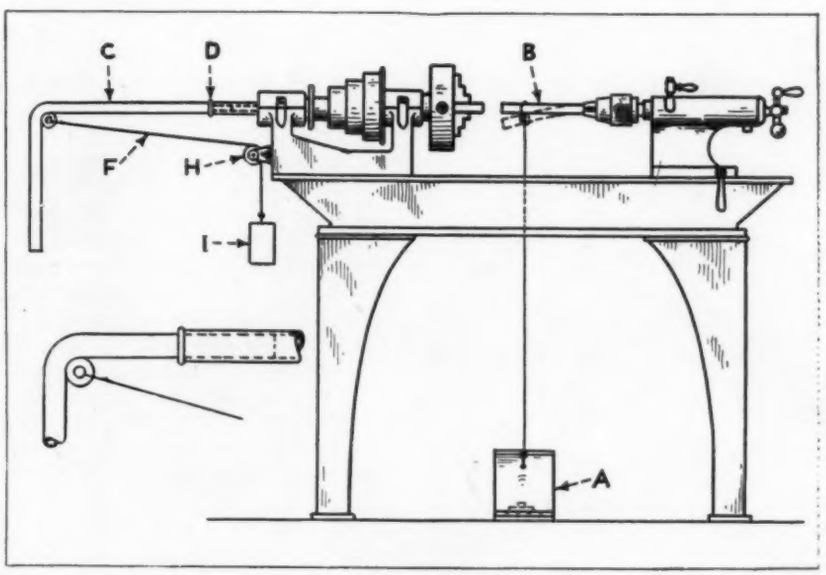
Cutting large quantities of short spacers from small tubing in an ordinary lathe was always a tedious job until the set-up described was evolved.

Referring to the sketch, the lathe motor is connected through the improvised foot-operated switch *A*, to the leaf of which is attached a cord to pull the flexible stop *B* out of the way when it is depressed to start the motor, as indicated in dotted lines.

The mechanism for feeding the stock to the stop consists of the rod *C*, the outer end of which is bent at a right angle, the horizontal part entering the tubing until stopped by the washer *D* soldered to it, and the cord *F*, one end of which is attached to an eye at the bend, the other end passing over the pulley *H* to the weight *I* to which it is fastened.

With the motor stopped and the chuck jaws open, the weight pulls rod forward until the washer pushes the tubing against the stop in the tailstock. The operator then closes the chuck jaws and starts the motor by stepping on the switch leaf which at the same time pulls the flexible stop out of the way. Then he feeds in the tool to cut off a spacer.

The nose of the tool is ground at an angle so that the spacers will have no burrs, the burr left on the stock being cut off by further inward feed of the tool. The rod *C* should be long enough so the stock can be used down to the last few inches, and is bent so that the overhanging weight of its tail will prevent it from revolving with the stock and snarling the cord.



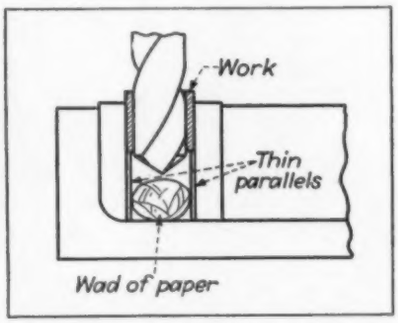

*With the chuck jaws open, the weight pulls the feed rod forward and pushes the tubing against the stop*

## Simple Parallel Separators

C. W. ANDERSON

In drilling through work held in a machine vise it is generally supported on parallels so that the drill can come through without injuring the vise. Very thin parallels have to be used at times when the diameter of the drilled hole is almost as large as the width of the work, as shown in the illustration. In such cases the parallels often tend to shift or fall over while the work is being placed.

A satisfactory way to keep the parallels against the vise jaws is to crumple two pieces of paper into wads and place them between




*Where very thin parallels are used to support work held in a machine vise, they can be kept against the jaws by wads of paper*

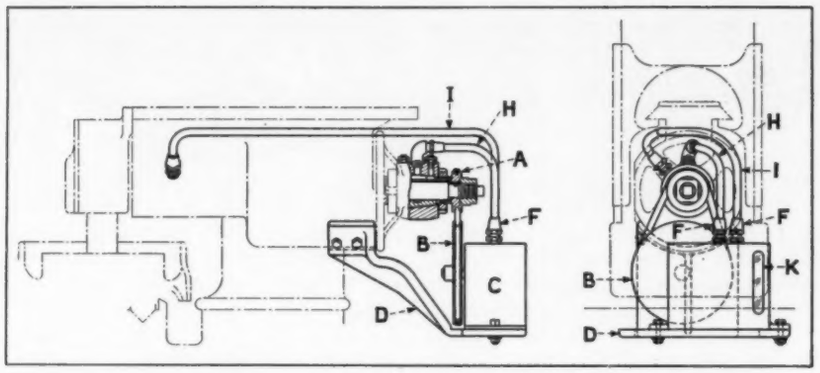
the parallels, placing one wad at each end. The paper wads should be large enough to press each parallel against a vise jaw, but small enough so they will not tend to push the work up off the parallels as the vise is being closed. The hole or holes can then be drilled in the work without fear of the drill striking either parallel.

## Spindle Bearings Lubricated Automatically

J. R. WHITTLES

Some time ago we replaced the sight-feed lubricator for lubricating the front and rear bearings of the wheel spindle of our surface grinder with a device that made lubrication automatic.

We used a commercial lubricator having two outlets and operated by a pump provided with gear reduction so that it could be driven from the wheel spindle, which ran at 1,160 r.p.m. In place of the thrust collar that was on the spindle, we used the hardened pulley *A* to take the thrust and to provide means for driving the lubricator pump. The pulley *B* was attached to the pump shaft and the two pulleys, which were guarded for safety, were connected by a V-belt. The lubricator *C* was attached to a pad on the bracket *D*, which was attached in turn to the bottom of the wheel slide and moved with it. The bolt holes for attaching




*A pump-operated lubricator holding two quarts of oil and attached to the grinder made lubrication of the wheel-spindle bearings entirely automatic*

the lubricator to the bracket were elongated so that it could be adjusted to take up the stretch of the belt.

Threaded into the top of the lubricator are the two nipples *F* to which are attached the flexible tubes *H* and *I* leading to the bearings. The lubricator holds about two quarts of oil and has an inserted glass at *K* for sighting the oil level.

The amount of oil delivered to the bearings depends upon the number of revolutions of the pulley *B* and a separate adjustment in the lubricator.

## Special Expansion Mandrel

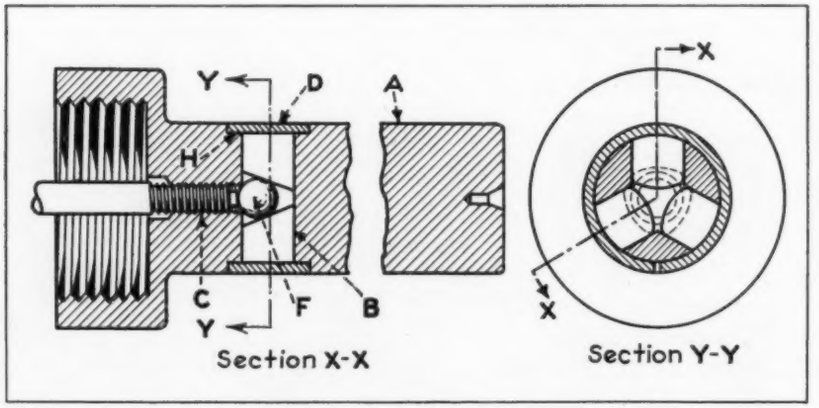
N. V. SMITH
*President, Smith-Johnson Corporation*

The illustration shows a mandrel for holding thin-walled steel tubing for threading, knurling and roll forming. The tubing, which forms a snug fit on the mandrel, is gripped at one end by the expansion of a split ring.

The device consists of the body *A* which is threaded to fit the spindle nose of the lathe, the outer end being supported by the tailstock center; the three hardened plugs *B* which are beveled at their inner ends; the threaded rod *C*; the split ring *D*; and the steel ball *F*. The split ring fits in the groove *H* and holds the plugs in place. The rod *C*, which is screwed into a tapped hole in the end of the mandrel, extends through the hole in the lathe spindle, and is operated by a knob at its outer end.

The three plugs are first made a snug push fit in their holes and, with all parts of the mandrel assembled except the split ring, their outer ends are ground flush with the bottom of the groove for the split ring. They are then taken out and reduced enough in diameter to make them an easy slip fit in their holes.

With a length of tubing in place on the mandrel, the threaded rod is tightened up. This pushes the steel ball against the beveled ends of the plugs, forcing them outward and expanding the split ring to hold the end of the tube firmly while the operations are being performed.

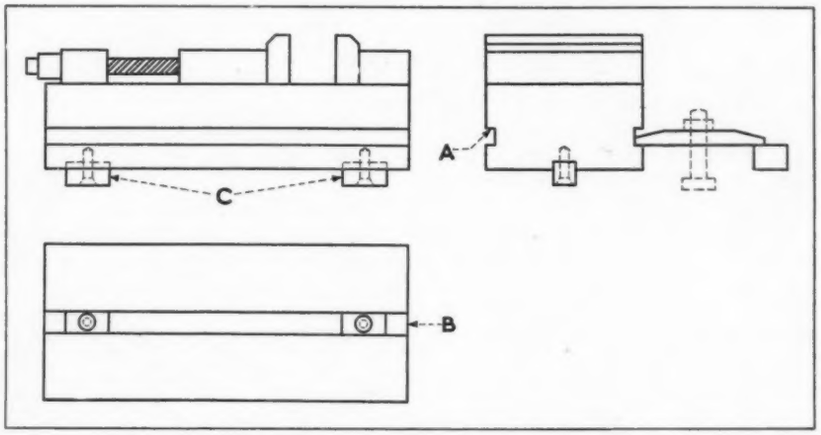



*Tubing on this mandrel is gripped at one end by a split ring expanded by forcing a steel ball between the beveled ends of three steel plugs*

## Clamping Straps Extend Usefulness of Vise

ROBERT S. ALEXANDER

Referring to the article under the above title by Charles H. Willey (*AM*—Vol. 82, page 1920) I have used drill-press vises equipped with the extension straps described by Mr. Willey for many years on grinders and milling machines. However, I have now dispensed with the straps and mill a $\frac{5}{8}$-in. slot along each side of the base, as at *A*, just deep enough to give the clamps room to "bite."




*Slots on the sides of the vise give room for clamps. Short tongues in a slot in the bottom of the vise engage the T-slots of machine tables*

I have found it to be of advantage to mill a length-wise slot in the bottom of a drill-press vise, as at *B*, as near the center as possible and at a right angle to the jaws, and to attach therein two short tongues *C* of key stock to engage the narrow parts of the T-slots in the tables of machines. The tongues align the vise with the machine table and the vise can then be used to pinch hit for regular equipment. To return the vise to its regular duty on the smooth surface of the drill-press table, it is a simple matter to remove the tongues by taking out the screws.

*Time-Data Sheet No. 21*

# Milling and Profiling Time Data—V

*Continued from Time Data Sheet No. 20 (AM—Vol. 83, page 48)*

## SYNTHESIS—SET UP TIME:

*Constant per job:*
$0.1660 = 1.03 \quad (A_2 + B_2 + E_2 + G_2) = 1.03 \quad (0.0500 + 0.0178 + 0.0865 + 0.0070)$

*Constant per operation:*
$0.1430 = 1.03 \quad (D_2 + F_2 + J_2 + L_2 + H_2) = 1.03 \quad (0.141 + 0.0062 + 0.0304 + 0.0825 + 0.0060)$

*Constant per end mill cutter in milling machine:*
$0.0940 = 1.03 \quad (Y_2 + D_2 + A_2) = 1.03 \quad (0.0320 + 0.0154 + 0.437)$

*Constant per cutter in profiler:*
$0.0970 = 1.03 \quad (Z_2 + C_2 + B_2) = 1.03 \quad (0.0320 + 0.0092 + 0.528)$

*Constant for one cutter on milling machine arbor:*
$0.1290 = 1.03 \quad (P_2 + T_2 + F_2) = 1.03 \quad (0.0927 + 0.0278 + 0.0050)$

*Constant for two cutters on milling machine arbor:*
$0.2630 = 1.03 \quad (Q_2 + U_2 + G_2) = 1.03 \quad (0.2060 + 0.0370 + 0.0117)$

*Constant for three cutters on milling machine arbor:*
$0.3480 = 1.03 \quad (R_2 + V_2 + G_2) = 1.03 \quad (0.2861 + 0.0400 + 0.0117)$

*Constant for four cutters on milling machine arbor:*
$0.4590 = 1.03 \quad (S_2 + W_2 + G_2) = 1.03 \quad (0.3865 + 0.0473 + 0.0117)$

*Constant per arbor on milling machine:*
$0.0770 = 1.03 \quad (N_2) = 1.03 \quad (0.0745)$

*Constant for set trip dogs on table travel or on side of machine:*
$0.0096 = 1.03 \quad (E_2) = 1.03 \quad (0.0093)$

*Constant for each additional cutter having no collars between:*
$0.0052 = 1.03 \quad (J_2) = 1.03 \quad (0.0050)$

*Constant for small fixture (holding parts up to 5 lb.):*
$0.0840 = 1.03 \quad (B_4 + L_4 + G_4 + K_4) = 1.03 \quad (0.0290 + 0.0126 + 0.0300 + 0.0103)$

*Constant for medium size fixture (holding parts 5.1 to 20 lb.):*
$0.0950 = 1.03 \quad (C_4 + M_4 + G_4 + K_4) = 1.03 \quad (0.0359 + 0.0157 + 0.0300 + 0.0103)$

*Constant for large fixture, handled by hand (holding parts 20.1 to 45 lb.):*
$0.1660 = 1.03 \quad (D_4 + N_4 + G_4 + K_4) = 1.03 \quad (0.0960 + 0.0251 + 0.0300 + 0.0103)$

*Constant for very large fixture, handled by jib crane (holding parts 45.1 to 75 lb.):*
$0.2000 = 1.03 \quad (E_4 + P_4 + G_4 + K_4) = 1.03 \quad (0.1235 + 0.0304 + 0.0300 + 0.0103)$

*Constant for very large fixture, handled by overhead crane (holding parts over 75 lb.):*
$0.2030 = 1.03 \quad (M_2 + A_6 + F_4 + G_4 + Q_4 + K_4) = 1.03 \quad (0.0500 + 0.0451) + 0.0450 + 0.0300 + 0.0165 + 0.0103)$

*Constant for vise:*
$0.0740 = 1.03 \quad (W_2 + Z_2 + A_4) = 1.03 \quad (0.0420 + 0.0196 + 0.0103)$

*Constant for small angle plate:*
$0.1050 = 1.03 \quad (K_2 + M_2 + P_2) = 1.03 \quad (0.0290 + 0.0602 + 0.0126)$

*Constant for large angle plate (handled by jib crane):*
$0.3130 = 1.03 \quad (L_6 + N_2 + Q_2) = 1.03 \quad (0.1235 + 0.1500 + 0.0304)$

*Constant for first clamp and bolt—table work:*
$0.0268 = 1.03 \quad (T_2 + U_2) = 1.03 \quad (0.0090 + 0.0170)$

*Constant for each additional clamp and bolt—table work:*
$0.0178 = 1.03 \quad (V_2) = 1.03 \quad (0.0173)$

*Constant for set up in vise:*
$0.0415 = 1.03 \quad (Y_2) = 1.03 \quad (0.0403)$

*Constant for index head:*
$0.0880 = 1.03 \quad (R_4 + S_4 + V_4) = 1.03 \quad (0.0599 + 0.0150 + 0.0103)$

*Constant for index tail stock:*
$0.1860 = 1.03 \quad (T_4 + U_4 + W_4) = 1.03 \quad (0.1594 + 0.0112 + 0.0103)$

*Constant for set oil pipes:*
$0.0074 = 1.03 \quad (K_2) = 1.03 \quad (0.0072)$

*Place additional support on milling machine:*
$0.0224 = 1.03 \quad (X_2) = 1.03 \quad (0.0218)$

*Fasten locating block to angle plate:*
$0.0490 = 1.03 \quad (Z_4) = 1.03 \quad (0.0475)$

## SYNTHESIS—EACH PIECE TIME:

*Constant for fixture work:*
$0.0043 = 1.03 \quad (X_7 + H_6 + T_6) = 1.03 \quad (0.0030 + 0.0006 + 0.0006)$

*Constant for vise work:*
$0.0077 = 1.03 \quad (J_6 + H_3 + T_6 + Q_6 + R_6) = 1.03 \quad (0.0020 + 0.0006 + 0.0006 + 0.0031 + 0.0012)$

*Constant for table work:*
$0.0033 = 1.03 \quad (A_6 + H_6 + T_6) = 1.03 \quad (0.0020 + 0.0006 + 0.0006)$

*Constant for part on index between centers:*
$0.0111 = 1.03 \quad (K_9 + N_9 + P_9 + Q_9 + R_9 + S_9) = 1.03 \quad (0.0008 + 0.0014 + 0.0042 + 0.0022 + 0.0014 + 0.0008)$

*Constant for part on index held in chuck:*
$0.0072 = 1.03 \quad (K_9 + M_9 + W_9 + X_9 + Y_9) = 1.03 \quad (0.0008 + 0.0007 + 0.0019 + 0.0018 + 0.0018)$

*Constant for part on index held in chuck and tail stock:*
$0.0095 = 1.03 \quad (K_9 + T_9 + U_9 + X_9 + V_9) = 1.03 \quad (0.0008 + 0.0014 + 0.0030 + 0.0018 + 0.0022)$

*Constant per index or turn of index head:*
$0.0062 = 1.03 \quad (L_6 + H_6 + T_6) = 1.03 \quad (0.0048 + 0.0006 + 0.0006)$

---

*Table No. 3—Parts in Fixture:*
$0.0021 = 1.03 \quad (C_7 + S_7) = 1.03 \quad (0.0012 + 0.0008)$ =constant for very small part
$0.0032 = 1.03 \quad (D_7 + T_7) = 1.03 \quad (0.0018 + 0.0013)$ =constant for small part
$0.0063 = 1.03 \quad (E_7 + U_7) = 1.03 \quad (0.0036 + 0.0025)$ =constant for medium part
$0.0094 = 1.03 \quad (F_7 + V_7) = 1.03 \quad (0.0052 + 0.0039)$ =constant for large part
$0.0157 = 1.03 \quad (Q_6 + R_6) = 103 \quad (0.0088 + 0.0064)$ =constant for very large part
$0.0802 = 1.03 \quad (G_7 + W_7) = 1.03 \quad (0.0352 + 0.0427)$ =constant for very large part (jib crane)

---

*Table No. 4—Parts in Vise:*
$0.0014 = 1.03 \quad (K_6 + V_6) = 1.03 \quad (0.0008 + 0.0005)$ =constant for very small part
$0.0024 = 1.03 \quad (L_6 + W_6) = 1.03 \quad (0.0013 + 0.0010)$ =constant for small part
$0.0045 = 1.03 \quad (M_6 + X_6) = 1.03 \quad (0.0025 + 0.0019)$ =constant for medium part
$0.0071 = 1.03 \quad (N_6 + Y_6) = 1.03 \quad (0.0039 + 0.0030)$ =constant for large part
$0.0085 = 1.03 \quad (L_6 + W_6 + K_6 + L_6) = 1.03 \quad (0.0013 + 0.0010 + 0.0035 + 0.0024)$ =constant for small part, one end clamped
$0.0106 = 1.03 \quad (M_6 + X_6 + K_6 + L_6) = 1.03 \quad (0.0025 + 0.0019 + 0.0035 + 0.0024)$ = constant for medium part, one end clamped
$0.0132 = 1.03 \quad (N_6 + Y_6 + K_6 + L_6) = 1.03 \quad (0.0039 + 0.0030 + 0.0035 + 0.0024)$ =constant for large part, one end clamped

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*Table No. 5—Parts on Table:*
$0.0024 = 1.03 \quad (B_6 + F_6) = 1.03 \quad (0.0013 + 0.0010)$ =constant for small part
$0.0046 = 1.03 \quad (C_6 + G_6) = 1.03 \quad (0.0025 + 0.0019)$ =constant for medium part
$0.0071 = 1.03 \quad (D_6 + H_6) = 1.03 \quad (0.0039 + 0.0030)$ =constant for large part
$0.0118 = 1.03 \quad (G_6 + H_6) = 1.03 \quad (0.0064 + 0.0051)$ =constant for very large part
$0.0640 = 1.03 \quad (E_6) = 1.03 \quad (0.0622)$ =constant for very large part (using jib crane)

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*Time-Data Sheet No. 22*

# Milling and Profiling Time Data—VI

*Table No. 6—Line up part:*
0.0016=1.03 ($U_8$)=1.03 (0.0015)=constant for line up part with scale.
0.0093=1.03 ($V_8$)=1.03 (0.0090)=constant for line up small part with surface gauge.
0.0155=1.03 ($W_8$)=1.03 (0.0150)=constant for line up medium part with surface gauge.
0.0320=1.03 ($X_8$)=1.03 (0.0310)=constant for line up medium part with surface gauge.
0.0062=1.03 ($Y_8$)=1.03 (0.0060)=constant for line up small part with square.
0.0124=1.03 ($Z_8$)=1.03 (0.0120)=constant for line up medium part with square.
0.0299=1.03 ($A_8$)=1.03 (0.0290)=constant for line up large part with square.
0.0113=1.03 ($B_8$)=1.03 (0.0110)=constant for line up small part with level.
0.0206=1.03 ($C_8$)=1.03 (0.0200)=constant for line up medium part with level.
0.0360=1.03 ($D_8$)=1.03 (0.0350)=constant for line up large part with level.

*Constant for clamp (already in place):*
0.0061=1.03 ($K_8 + L_8$)=1.03 (0.0035 + 0.0024)
*Constant for clamp (clamp and nut—placed and removed complete):*
0.0120=1.03 ($M_8 + N_8$)=1.03=(0.0076 + 0.0040)
*Constant per locating pin in fixture:*
0.0048=1.03 ($H_7 + J_7$)=1.03 (0.0018) + 0.0028)
*Constant per screw tightened by hand:*
0.0033=1.03 ($K_7 + L_7$)=1.03 (0.0023 + 0.0009)
*Constant per screw tightened by wrench:*
0.0055=1.03 ($M_7 + N_7$)=1.03 (0.0035 + 0.0018)

*Constant per thumb nut tightened by hand:*
0.0013=1.03 ($P_7 + Q_7$)=1.03 (.0008 + .0005)
0.0003=1.03 ($L_8$ or $M_8$)=Move table by quick traverse (per inch).
0.0004=1.03 ($S_8$)=Engage feed or rapid traverse.
0.0005=1.03 ($J_8$ or $K_8$)=Move table by hand (per inch).
0.0055=1.03 ($V_8$)=No. of times table is raised or lowered.
0.0022=1.03 ($X_8 \times 2$)=No. of times profiler head is raised or lowered.
0.0034=1.03 ($Y_8$)=No. of times profiler head is set and locked.
0.0048=1.03 ($Y_7$)=No. of times cutter is set to set piece.
0.0113=1.03 ($Q_8$)=No. of times cut is started to mill keyway.
0.0175=1.03 ($P_8$)=No. of times cut is started to profile keyway.
0.0008=1.03 ($R_7$)=No. of times cover is opened and closed.
0.0084=1.03 ($T_8$)=No. of times part is shimmed.
0.0022=1.03 ($S_8$)=No. of times jacks are set.
0.0168=1.03 ($P_8$)=No. of times part is lined up and set with cutter, where set up will not repeat.
0.0011=1.03 ($R_8$)=Center part in vise, fixture or on table.
0.0258=1.03 ($B_8$)=Jib crane lift (when an additional lift is required).
0.0020=1.03 ($Z_8$)=Move stock forward in vise (bar stock).
0.0164=1.03 ($Y_8$)=Place C-clamp on bar stock.
0.0027=1.03 ($C_8$)=Gage with micrometer.
0.0013=1.03 ($D_8$)=Gage with snap gauge.
0.0013=1.03 ($E_8$)=Gage with calipers.
0.0017=1.03 ($F_8$)=Gage with scale.

**INSPECTION:**

Work as inspected for dimensions as per drawing and item and for finish as per requirements of the job.

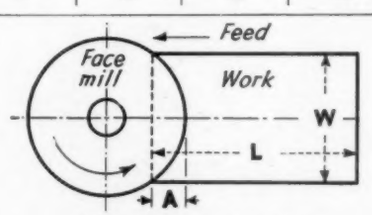
**WAGE PAYMENT:**

Standard time wage payment on either group or individual incentive plan.

*(To be continued in an early issue.)*

**TABLE No. 9 — Approach of Cutter for End Mills and Face Mills**

| Dia. of Mill *Inches* | Width of Cut in Inches | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 1 | 0.500 | | | | | | | | | | | |
| 1½ | 0.192 | | | | | | | | | | | |
| 2 | 0.135 | 1.000 | | | | | | | | | | |
| 2½ | 0.105 | 0.500 | | | | | | | | | | |
| 3 | 0.090 | 0.370 | 1.500 | | | | | | | | | |
| 4 | 0.070 | 0.270 | 0.680 | 2.000 | | | | | | | | |
| 5 | 0.050 | 0.240 | 0.500 | 1.000 | 2.500 | | | | | | | |
| 6 | 0.040 | 0.180 | 0.400 | 0.770 | 1.340 | 3.000 | | | | | | |
| 7½ | 0.040 | 0.140 | 0.320 | 0.590 | 0.960 | 1.510 | 2.630 | | | | | |
| 8 | 0.033 | 0.130 | 0.291 | 0.540 | 0.880 | 1.360 | 2.070 | 4.000 | | | | |
| 10 | 0.025 | 0.100 | 0.230 | 0.430 | 0.560 | 1.000 | 1.430 | 2.000 | 2.820 | 5.000 | | |
| 12 | 0.020 | 0.080 | 0.190 | 0.350 | 0.540 | 0.810 | 1.130 | 1.530 | 2.040 | 2.690 | 3.600 | 6.000 |




A = approach of cutter
L = length of cut W = width of cut

**The approach of cutter is the distance the table must move the work into the cutter before full cutting action takes place. When the quality of finish required makes it advisable to continue the travel until the cutter has entirely cleared the work, the diameter of the cutter must be used instead of the values shown.**

# Forty and Over

MRS. SMITH leaned over the back fence in earnest conversation with her neighbor. Said she, "Do you know that the XYZ Company won't employ any new worker who is forty or over? Yes sir, Bill told me that last night. Can you imagine that!"

Such talk has been spread in many places. A little of it is true, most of it false, if one can judge from indignant denials by management and from statements which individual companies have made about their own favorable status.

The obvious thing to do when you say that a thing is true and I say it isn't is to try to find out the facts. That is what the National Association of Manufacturers has done regarding employment of older men. It has dug up the facts and published them in a 64-page booklet, "Workers Over Forty," leaving to the public the decision about industry's fairness.

It found that workers over forty rose from 28 per cent of the total in 1937 to 34 per cent in 1938. It found that 51 per cent of the companies did not show preference to younger men in hiring help, as against 38 per cent who did (almost 11 per cent did not report on this point). It found that 89 per cent have no maximum age limit in taking on new men.

It found that 51 per cent of the companies reported older workers just as efficient as younger and that 33 per cent regarded the efficiency of older workers as higher. It found that almost 92 per cent considered older workers as having the same or more ability than the younger men. It found that the health records of the older men were as good as those of the younger and that there was less accident risk in employing older workers than in employing younger workers.

Here then are accurate figures bearing on the older worker. They do not represent a small sampling. They were culled from questionnaires filled out by 2,485 companies employing over 2,300,000 workers. They may well be taken as a cross-section of the practices of American industry.

The results of this survey do more than serve the purpose of refuting charges of discrimination against older workers. They prove that employment of men of mature years is sound and profitable business aside from any social benefits which might accrue.

This survey also provides an excellent technique for industry to use in telling its story to the public. The best way to clear up any misunderstanding is to get at the facts, assemble them and then see that they are as widely disseminated as possible.

Burnham Finney

# GAGING BUSINESS

Operations in metal-working industry continue expanding, with still greater Spring activity expected. Foreign orders remain prominent; government purchases are increasing

Sales and plant operations in the metal-working industry are looking up. Moreover, the volume and character of inquiries indicate an active Spring season. Machine tool bookings this month appear likely to equal those in January when the National Machine Tool Builders' index rose to 150.8, compared with 146.5 in December. Foreign orders continue to account for a healthy percentage of the business, but sales to domestic buyers are growing, with the government and aircraft companies the best sources. Steel production is up to 54.8 per cent and is expected to advance further in March. Much stimulus is felt in all branches of the metal-working industry from government purchases for defense purposes. The aircraft industry is on the verge of important expansion as foreign countries place large orders and as the United States army and navy program promises to get under way soon. Despite a seasonal lull this month, automobile assemblies will pick up next month and a good Spring trade is anticipated. Railroad equipment makers are doing better as orders for passenger cars and freight cars accumulate.

NEW ENGLAND—Machinery sales are fairly brisk and inquiries good. The Naval Torpedo Station at Newport is planning a $500,000 shop expansion layout, which will include many machine tools. American Brass Company at Waterbury expects to spend $500,000 for mill and equipment development. Bethlehem's Fore River shipyard is low bidder on two 6,000-ton light cruisers for the U. S. Navy at a cost of $11,695,000 each.

NEW YORK—Several machinery dealers report a bigger volume of business since January 1 than in all of 1938. General Electric is inquiring for machine tools for the first time in months. American Car & Foundry and American Brake Shoe also are in the market. Purchases of brakes, shears and other power equipment by small sheet metal shops are growing. Japan still is a sizable buyer of American machine tools. German interests are reported preparing to order precision machines.

PITTSBURGH—Steel sales have not expanded as hoped for at the turn of the year, but mills continue confident of a slow steady increase in tonnage later in the quarter. Railroad equipment buying and tin plate specifications have aided the market. Industrial production is at 79.9 on the index of the University of Pittsburgh, compared with 62.9 a year ago. Heavy machinery sales are poor.

CLEVELAND—Auto parts companies have yet to feel the impetus of Spring releases from car manufacturers. Steel output continues at a moderate rate. Machine tool bookings in February promise to be as good as in January and possibly better.

CINCINNATI—Machine tool orders are growing in volume as a result of foreign buying, federal government purchases for defense purposes and scattered purchases. The biggest impetus, however, comes from abroad.

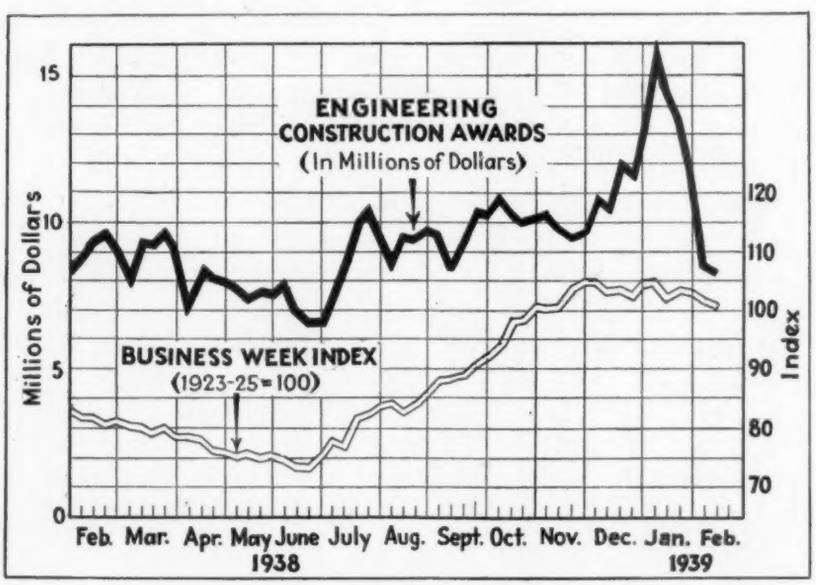
DETROIT—Important equipment buyers have temporarily clamped the lid on machinery expenditures. One reason for this policy is the uncertainty of the labor situation, with two groups battling for control of the United Automobile Workers union.

CHICAGO—International Harvester's machinery purchases for its Farmall tractor plant have enlivened the market. Companies, such as aircraft parts supplier, doing work connected with national defense are busy. Small tool demand is better than last year, with Dumore reporting a vigorous foreign business. Chicago & Rock Island will open bids March 1 for two streamline trains. Illinois Central is considering new train purchases. Missouri Pacific will spend over $4,600,000 on diesel engines, streamline trains and 1,080 flat bottom coal cars. Chicago & Northwestern is to buy 900 freight cars and 20,000 tons of rails. Local steel production is slowly rising. Farm implement and tractor manufacture is beginning to look up.

SAN FRANCISCO—Production and payrolls are continuing to rise. The slight improvement in Far West machine tool orders shows little sign of going further. Shipyards have produced a few orders.

## CONSTRUCTION AWARDS VS. GENERAL BUSINESS

*The pronounced dip in engineering construction awards is in sharp contrast to other industrial indexes, notably steel ingot production and electric power consumption, which are rising more than seasonally*



# NEWS OF THE INDUSTRY

## ADOPTION OF JOB EVALUATION URGED AT A.M.A. CONFERENCE

CHICAGO—One of the principal needs of industry today is the establishment of a system of job evaluation and rating which will assure every worker proper compensation, based on the qualifications and abilities necessary to perform his job, according to W. R. Coley, factory manager, Leeds & Northrup Co., speaking before 1200 industrial relations executives at the Industrial Relations Conference of the American Management Association held in Chicago Feb. 15–17.

"Recognition of the worker as a human being, and recognition of the fact that his income should be properly adjusted in relation to the skill he is called upon to use in performing his daily task, at the same time adjusted to meet market rates of pay in similar lines of work, are certainly matters which should be given great weight in our dealings with our employees," he declared.

Concerning the advisability of applying the British and Swedish systems of collective bargaining to the United States, Ivan L. Willis, assistant industrial relations manager, Standard Oil Co. of New Jersey, asserted that adapting the British system to the United States would tend to create conspicuous class consciousness. "Instead of looking for a solution of our problems in the direction of trying still further to force labor into positions where it will be a class part. we should be devoting our efforts to a solution of the problem in a manner consistent with our democratic ideals," he added.

Also of interest to the delegates was the discussion of the "Regularization of Employment" by C. Canby Balderston, professor of industry, University of Pennsylvania.

## NO BARTERING WITH GERMANY

WASHINGTON—Opinion is that Germany's proposal to barter farm machinery, barbed wire, etc., for wheat and lard will "get the bird" from the State Department. The Reich is not one of the "favored nations" in the reciprocal trade set-up, and thus would have to pay full tariff duties on exports to this country. If that wall didn't prove high enough, Mr. Hull would find ways to raise it.

## Foreign and Domestic Armament Programs Greatly Stimulate Aircraft Manufacture

### RUSSIAN COMMISSION SHOPPING

WASHINGTON—A commission of eight Soviet naval experts, headed by Admiral Ivan Stepanovitch Isakoff, vice-commissar of the Red navy, has been dispatched to the United States, presumably to negotiate with American metal-working companies for the fabrication of parts to be shipped to Russia for assembly into giant battleships.

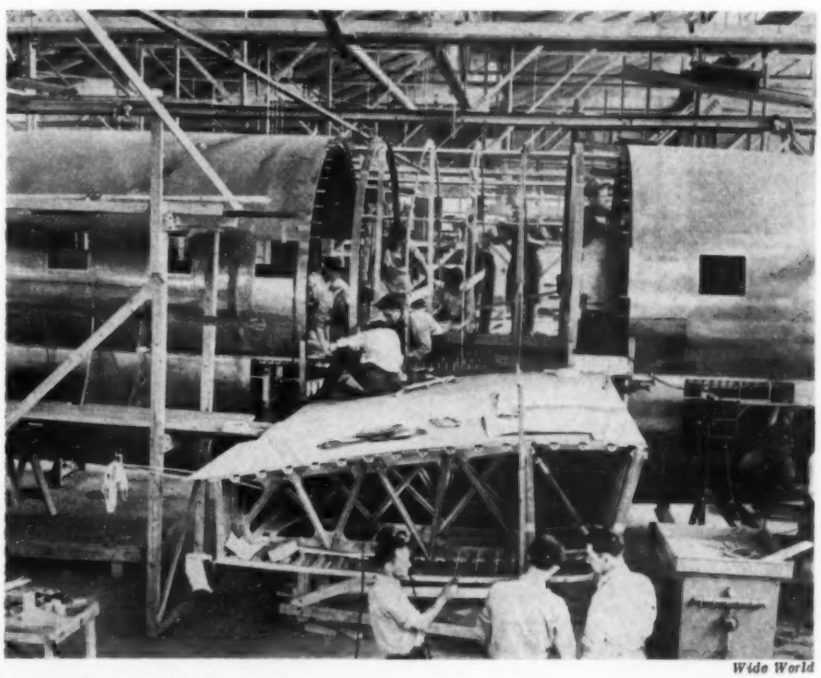
It is understood that no objection will be made to Russia's contracting for battleships or parts from American manufacturers, provided such moves do not interfere with this country's own naval construction program.

*France Comprises Major Export Market With Over $60,000,000 Worth of Purchases*

NEW YORK—America's most talked about industry—airplane manufacture—is about ready to shift from second gear into high as foreign governments place orders here and as the Army and Navy aircraft programs for expansion are perfected. This quickened pace means sizable business for machinery builders.

Only recently four or five airplane factories were virtually shut down for lack of orders, though some plants, especially prominent companies on the Pacific Coast, continued to operate one or two full shifts. This undesirable condition is rapidly being remedied.

The French have done the most spectacular buying. Their war plane



Wide World

**Expanding Industry**—*Wing center-section assembly is placed in position in the new giant stratosphere plane now being built in the St. Louis plant of Curtiss-Wright. Over 32 ft. long, this wing section alone weighs 2,200 lb. minus the leading and trailing edges. After an outer panel is added to each side, the total wing span will be 108 ft.*

purchases to date have totaled 615 units costing over $60,000,000. This business is reported divided as follows: 200 Curtiss Hawk 75-A pursuit planes, 200 North American Aviation light bombers, 115 Glenn Martin light bombers and 100 Douglas bombers.

Things are moving so swiftly in the industry that one finds it difficult to keep pace with developments. Glenn Martin has placed a substantial amount of machine tool business with several companies and is yet to buy more. Allison Engine and Wright Aeronautical continue in the market for new equipment. Wright has been busy for months turning out engines. Pratt & Whitney, after a period of moderate operations, is stepping up its production of aircraft engines.

The stimulating effect of aircraft activities is not confined to airplane companies, extending to companies making motors, motor parts and fittings for ships. Instrument makers already are running at top speed. It is known that the larger planes take an average of ten small auxiliary motors, thus enlivening the small motor market. A large number of these parts companies are expected to buy from a tool or two up to a battery of machines.

## ALUMINUM PRODUCTION FIRM; ONLY SLIGHT DROP FOR 1938

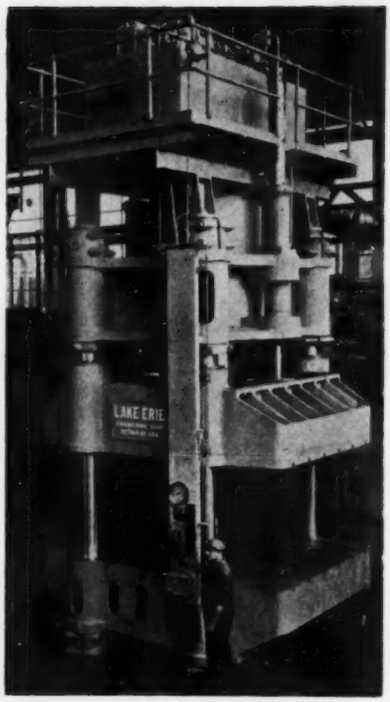
WASHINGTON—New aluminum production in the United States during 1938 was only slightly less than the record output of 1937, according to the Bureau of Mines, United States Department of the Interior. A total of 286,882,000 lb. valued at $56,659,000 was produced in 1938, compared with 292,681,000 lb. valued at $55,609,000 in 1937, a decrease of only 2 per cent.

For the first time in recent years the plant at Alcoa, Tenn., produced more metal than the plant at Massena, N. Y. The Alcoa works accounted for 40 per cent and the Massena works for 34 per cent of the aluminum made in the United States in 1938. The balance was produced at Badin, N. C., and Niagara Falls, N. Y.

## ORDERS NEW ROLLING STOCK

NEW YORK—The Pennsylvania Railroad has contracted for the construction of fifteen dining cars and twelve coaches, an order amounting to about $2,100,000.

Five of the diners and all of the coaches will be built of steel by the Edward G. Budd Mfg. Co. by its "shotweld" process. Five more diners will be constructed of aluminum alloy by the Pullman Standard Car Mfg. Co., while the remaining five will be constructed of high tensile steel by the American Car & Foundry Co.




**For French Planes**—*This 2,500-ton capacity hydraulic press is one of fourteen of various sizes shipped to the French Air Ministry by the Lake Erie Engineering Corp., Buffalo, for forming duralumin sections of airplane wings, pontoons, and fuselage parts. Press above weighs almost 200 tons and required six freight cars for transportation to the seaboard*

### RECEIVES FRENCH ORDER

EAST HARTFORD — Pratt & Whitney Div., United Aircraft Corp., is reported as having received an $11,000,000 order from the French government for plane engines and parts.

## PRATT & WHITNEY BARES PLAN FOR NEW PLANT CONSTRUCTION

HARTFORD—Pratt & Whitney Div., Niles-Bement-Pond Co., will begin construction "as soon as weather conditions permit" of a new factory and office building, it has been revealed by Clayton R. Burt, president.

The announcement was the outcome of a meeting of the board of directors at which president Burt was authorized to proceed at once with the construction of the new plant. It will consist of a one-story manufacturing building, a two-story office building, and a two-story pattern storage building, with garage and power plant. The total amount of floor space will approximate 700,000 sq.ft.

## GEAR MANUFACTURERS TO DISCUSS PRODUCTION, SAFETY PROBLEMS

WILKINSBURG, PA.—Problems in gear production will highlight the annual meeting of the American Gear Manufacturers Association to be held at the Hotel Cavalier, Virginia Beach, Va., May 22-24.

Rapidly nearing completion, the program will include several papers of interest to those concerned with other phases of gear manufacturing. The tentative program includes the following discussions:

*Modern Drafting Room Practice*, George R. Martins, Falk Corp.; *Gear Metallurgy*, E. J. Wellauer, Falk Corp.; *Importance of Safety*, E. S. Sawtelle, Tool Steel Gear & Pinion Co.; *Surface Hardening of Gear Teeth*, Dwight Van De Vate, Gleason Works; *Turret Lathes in a Gear Shop*, J. R. Longstreet, Warner & Swasey; *Oil Well Pumping Units*, R. Griffin De la Mater, Parkersburg Rig & Reel Co.; *Automotive Transmissions*, Mr. Rothrock, General Motors Corp.; *Bronze for Worm Gears*, Mr. Bierbaum, Lumen Bearing Co.

Additional information may be secured from J. C. McQuiston, secretary, 602 Shields Building, Wilkinsburg, Pa.

## STEEL, AIRCRAFT APPRENTICES EXEMPTED FROM WAGE RULING

WASHINGTON—The Public Contract Board's wage orders for steel and aircraft manufacturing are the first to contain exemptions for employment of apprentices. Exemptions may be applied only to workers who are under active indentures in accordance with the standards of the Federal Committee on Apprenticeship, which is a division of the Labor Department. Civil service examinations of FCA field personnel are emphasizing actual experience rather than too much book learning.

## OFFER COURSE IN WELDING

CLEVELAND—A special course in arc welding design and practice, sponsored by the American Society for Metals and the Lincoln Electric Co., will be held in the Rock Island Arsenal, Rock Island, Ill., beginning March 6.

The primary object of this course will be to provide engineers and designers in the Rock Island area with the opportunity for studying the redesign of products for arc welded construction. The course will include talks and demonstrations on welded design and construction, and consultation service on welding engineering problems.

# INSIDE DETROIT

Rupert Le Grand
DETROIT EDITOR

Lónger deliveries on machine tools and advancement of auto show date indicate that changes involving extensive equipment purchases may be held over until 1941

DETROIT—Advance of the New York Automobile Show to Oct. 15, a full four weeks ahead of last year's show, indicates the pattern of the changes to be incorporated in 1940 models. Mechanical changes involving extensive purchases of new equipment have not been released, and will probably be held over until 1941 models. The time in which to do something startling for next year is rapidly dwindling.

Design and production engineers were warned 90 days ago that machine tool deliveries are getting longer, because of buying from other sections of the country and of strong orders from abroad. Efforts will be made to take care of the automotive industry, but it is inescapable now that its orders will not be filled as soon as wanted.

Most activity for '40 now appears concentrated on machine changeovers, such as respacing of spindles and new fixtures. Some programs aimed at manufacturing economies may come along, also orders to complete machining lines for some slightly revised parts. Considerable attention has been focused on the Chrysler fluid flywheel drive, and something may be done along this line by other companies. Transmission changes of real importance had been looked for, but now minor modifications appear in order, such as moving the gear-shift opening from the front to the side, to remove the floor hump.

Some die work has been released, but the bulk of it is not expected for another two or three weeks. Large dies for turret tops ordinarily take from sixteen to eighteen weeks to complete. They should be released soon for tryouts in the latter part of July or early August. In a pinch, of course, such dies can be turned out in much less time, say eight weeks. It is understood that Ford, one of the last to announce new models and now well-equipped with the latest Keller die-sinkers, Gray and Ingersoll planers, and Southwark 50-ton die try-out presses, can beat this time appreciably.

### Continue Present Design Trends

Exterior changes of 1940 models will probably consist of revised fenders; modification of the catwalk cooling idea, which has been worked out well in most cases but needs more harmonious grille treatment in others; continuation of both the fast back and the "Cadillac 60" trunk back; somewhat wider bodies with fenders more nearly flush with the front doors. Interiors will use more plastics in pastel shades, harmonizing with custom-tailored fabrics. Improved cushioning, sound deadening, and ventilation will be emphasized for driver comfort.

### DEMAND FOR WELDING EQUIPMENT

DETROIT—Demands for quotations on additional resistance welding machines have hit an all-time high in the experience of one supplier, and another is working on several huge units. Hidden changes that mean little to the layman, but which are important with respect to simplified construction and assembly, will probably come about through further extensive application of welding to 1940 cars. Research and design engineers are playing with countless ideas involving this process.

### More Welding Applications

Many important advances were made in the 1939 models through welding (*AM*—Vol. 83, page 896c), particularly in rear-axle assembly, and other running-gear components. Talk is going round that the welded frame is not dead, and that the integral welded body-and-frame idea is actively being considered by at least two manufacturers. Packard is planning to use the unit body on its small six, which is scheduled to come out in July according to best advice. It is understood that one of the Chrysler units has been playing with the unit-body idea also.

### Reverse Assembly for Unit Bodies

Final assembly operations on the unit body will be reversed from present practice where a frame is laid on a conveyor and the running gear, motor and body are placed in position. According to Lincoln-Zephyr practice (*AM*—Vol. 82, page 362) the painted integral body and frame are suspended on an overhead conveyor while the springs, wheels and brake connections are assembled from underneath. The motor is dropped in last when the body is brought down on the floor. Such a complete change in practice requires installation of

**New Features, New Jobs**—*A new operation is required on the Buick final assembly line because of the introduction of the "Sunshine Turret Top." The sliding panels are inspected for finish, trim, and ease of operation*

special overhead conveyor equipment and re-arrangement of assembly methods.

From a manufacturing standpoint, several advantages are obtained from this system. First, the assembly conveyor is shorter, and therefore requires much less floor space. Second, there is nothing lying around on the floor to prevent ready access to the underframe, and jobs need not be done from pits. Loads up to three tons have been carried on this type of conveyor, which must be stronger than usual overhead conveyors, smooth-running, and supplied with more power.

A shift from the present system will not be attempted until thorough engineering studies are made, and the expenses of making the change are justified from an economic angle. And there has been a disposition to hold up much installation of new equipment while the labor situation is troubled.

**Production Continues Strong**

Current production continues at a lively pace, but Ford has dropped to a four-day week and deliveries on some models seem caught up. The Ford tire plant is now making 7,500 casings per day but operations can be stepped up to 18,000 per day with three shifts with the addition of equipment. It is unlikely that this will take place until the industry is operating again near a peak.

**Strongest**—*Said to be the most powerful in the world for its size, this tiny "Alnico" permanent magnet developed in the research laboratories of the General Electric Co. will lift 1,500 times its own weight. A steel sheath prevents demagnetization*

## PREPARING PATENT LAWS

WASHINGTON—Call up the patent committees on the Hill and you will be told they haven't heard of any patent legislation being written as a result of anti-monopoly hearings by the Temporary Economic Committee. Call up the Patent Office and you hear the same. But legislation *is* being written. Probably it incorporates most of the recommendations of Commissioner Conway P. Coe. Some observers say that the consensus during the T.N.E.C. hearings was that we need a more vigorous court set-up, rather than new law. If T.N.E.C. doesn't want to sponsor legislation this session, it will be introduced by individual members, or other Congressmen. There is some possibility that special patent committees will be organized. It is a safe bet that legislation will not be drastic, with no compulsory licensing.

## DEVELOP NEW PLATING PROCESS

CORAOPOLIS, PA.—A new electroplating plant, designed for applying nickel by a novel method, has been completed and placed in commercial production at the Coraopolis plant of the Standard Steel Spring Co.

The new plating process, termed "Corronizing" was developed in the company's research department, under the direction of J. Schoonmaker. It is said to provide a remarkable increase in the life of nickel-protected materials.

## GENERAL MOTORS AND HUDSON REPORT LARGE SALES GAINS

DETROIT—Buick sales in January broke all records for the month, and retail deliveries totaled 12,977 units, a gain of 37.5 per cent over January 1938. Used-car sales amounted to 28,038 units or roughly 4,000 more than a year previous.

Pontiac reported January sales better than a year ago by 65 per cent, but used car sales were on about the same level as twelve months earlier. However, employment is better than it was at the beginning of 1938, and no alarm is felt about the used-car situation. No special effort is being employed now to get rid of them, whereas a year ago the industry engaged in a strenuous campaign.

Hudson found sales in part of January at least 25 per cent ahead and had one week when they were better by 43 per cent.

For the seventh time in eight years Chevrolet led in passenger-car registrations in 1938. And it took first place in cars and trucks by a 100,000 margin. Sales for 1938 were only 38.6 per cent under 1937, when the industry as a whole suffered an average decline of 44.7 per cent. Since introduction of the 1939 models, the percentage of increase over corresponding months in the 1938 model year have mounted steadily. They increased over 6 per cent in November, 24 per cent in December and 31 per cent in January, when sales amounted to over 51,966 cars and trucks. Dealers sold 114,375 used vehicles in that month.

## U. S. Government Contracts Awarded to Metal-Working Firms

(Awarded from Jan. 23–Feb. 4 inclusive)

| Contractor | Gov't Agency | Commodity | Amount |
|---|---|---|---|
| Kilby Steel Co., Anniston, Ala. | Interior | Bolts | $66,112 |
| Treadwell Construction Co., Midland, Pa. | Interior | Roller gates | 59,960 |
| Philips & Davies, Inc., Kenton, Ohio | War, Engineers | Gates, hoists | 57,999 |
| Bay State Tool & Machine Co., Springfield, Mass. | War, Ordnance | Water chests | 42,312 |
| Scovill Mfg. Co., Waterbury, Conn. | Treasury | Nickel pieces | 52,000 |
| American Brass Co., Waterbury, Conn. | Navy, S. & A. | Copper-nickel plates | 23,473 |
| Cincinnati Planer Co., Cincinnati, Ohio | Panama Canal | Planer | 20,920 |
| Caterpillar Tractor Co., Peoria, Ill. | Interior | Tractors | 24,544 |
| Ajax Electrothermic Corp., Trenton, N. J. | War, Ordnance | Electric furnace | 32,619 |
| Curtiss-Wright Corp., Curtiss Propeller Div., Clifton, N. J. | Treasury, Air Corps | Propeller assemblies | 53,065 |
| New England Electric Co., Economy, Pa. | Interior | Steel tubing | 39,423 |
| Commercial Shearing & Stamping Co., Youngstown, Ohio | W.P.A., Treas., Proc. | Steel ribs | 28,000 |
| Riley Stoker Corp., Worcester, Mass. | War, Ordnance | Boiler equipment | 23,000 |
| National Malleable & Steel Castings Co., Cleveland, Ohio | Navy, S. & A. | Steel chain, fittings | 99,242 |
| Revere Copper & Brass Inc., Baltimore, Md. | War, Ordnance | Cartridge cups | 19,600 |
| The International Nickel Co., New York, N. Y. | Navy, S. & A. | Nickel-copper forgings | 58,162 |
| Gisholt Machine Co., Madison, Wis. | Navy, S. & A. | Lathes | 21,835 |
| Taylor-Parker Co., Norfolk, Va. | Navy, S. & A. | Twist drills | 17,458 |
| National Twist Drill & Tool Co., Detroit, Michigan | Navy, S. & A. | Twist drills | 21,667 |
| E. W. Bliss Co., Brooklyn, N. Y. | War, C.W.S. | Presses | 35,597 |
| Lodge & Shipley Machine Tool Co., Cincinnati, Ohio | Panama Canal | Lathe | 27,973 |
| Dreses Machine Tool Co., Cincinnati, Ohio. | Panama Canal | Drill press | 10,257 |
| Leland-Gifford Co., Worcester, Mass. | War, Ordnance | Drilling machines | 12,362 |
| Cincinnati Planer Co., Cincinnati, Ohio | War, Ordnance | Boring mill | 46,000 |
| R. K. LeBlond Machine Tool Co., Cincinnati, Ohio | Navy, S. & A. | Lathes | 23,040 |
| Lodge & Shipley Machine Tool Co., Cincinnati, Ohio | Navy, S. & A. | Lathes | 37,655 |

## SHIPMENTS OF AERONAUTICAL PRODUCTS CLIMB 73% IN 1938

WASHINGTON—Exports of aeronautical products during 1938 amounted to more than $68,000,000, an increase of 73% over 1937 shipments.

There were thirteen foreign markets which took over a million dollars worth of American aeronautical manufactures during the past year. Foremost among these were the Netherlands, with $11,774,043 worth of purchases, while Japan ran a close second with $11,062,477. China and the Argentine each absorbed slightly more than $6,000,000 worth of planes and plane equipment; Russia over $5,000,000; while the United Kingdom, Canada, and Turkey each accounted for well over $3,000,000. Brazil, Mexico, Australia, Hongkong and Sweden each took over a million dollars worth.

The next most important foreign outlets for American aircraft manufactures were France, Rumania, Poland, Colombia, Germany and Venezuela. Latin America, which five years ago absorbed over 28 per cent of aeronautic product exports, increased its orders by slightly less than 20 per per cent in 1938.

## NEW REVERE PROCESS UNITES STAINLESS STEEL AND COPPER

NEW YORK—Electrolytically pure copper is clad on the bottom of stainless steel cooking utensils by a new process worked out by the Rome Manufacturing Division of the Revere Copper and Brass, Incorporated.

This "Revere Ware" line of recently announced cooking utensils incorporates highly polished 18-8 stainless steel bodies with bottoms clad with a copper coating on the bottom equal to one and a half times the thickness of the steel sheet used. The line was designed by W. Archibald Welden, the manufacturing process having been developed by J. M. Kennedy, vice-president and general manager of the Rome Manufacturing Division.

## APPROVE COMPRESSED-AIR CODE

NEW YORK—The first safety code for compressed air machinery and equipment has been completed and approved by the American Standards Association.

This code is designed to cut down the number of accidents resulting from the wide use of compressed air in many types of industrial applications. Nineteen national organizations and two departments of the Federal Government have participated in its development under the leadership of the American Society of Mechanical Engineers and the American Society of Safety Engineers.

### New Hope

*Equipment such as this will soon again be rolling out of the plants of the major electrical products manufacturers. Renewed confidence inspired by the T.V.A.-Commonwealth & Southern agreement promises to be reflected in about three-quarters of a billion dollars worth of equipment orders from private utilities. This bank of autotransformers has been installed by the Nevada-California Electric Corp. to handle Boulder Dam power*

## UTILITIES SPENDING SEEN

NEW YORK—Those people who are banking on a billion dollar expenditure by public utilities for heavy electrical goods this year as an aftermath of the T.V.A.-Commonwealth settlement will be disappointed. Insiders will be surprised if the total outlay in 1939 exceeds very much the total of $450,000,000 for 1938. Unless relations between the government and the utilities receive an unexpected setback, the utilities are apt to spend around $700,000,000 for expansion of equipment in 1940. So far as one can see ahead, however, no billion-dollar years are in prospect.

## JAPS TO MAKE OWN ABRASIVES

TOKYO—An executive of the Toyo Precision Machinery Co. is reported negotiating with officials of the Norton Co., Worcester, Mass., for acquisition of patents and licenses covering the manufacture of Norton abrasive units, the *Nikkan Kogyo* reports.

At present the Mitsui Bussan Kaisha has exclusive agency rights in Tokyo for Norton products, which are said to monopolize the Japanese market. Import restrictions have lately cut into the volume of abrasives imported from the Massachusetts firm.

## MARITIME COMMISSION AWARDS TOTAL $130,000,000 FOR 1938

WASHINGTON—In its report to Congress, the Maritime Commission lists 51 ships let for construction during 1938 at a cost of $130,000,000. All but eight of these ships were for government account, to be leased, or sold when completed, for operation on foreign-service routes.

The eight private-account ships are the S.S. America for the United States Lines, four cargo bottoms for American Export, and three for Mississippi shipping. Standard Oil of New Jersey is building ten tankers, in addition, on which extra speed and other defense features were paid for by the government. Thus the Commission is well satisfied with its progress toward an auxiliary fleet for the Navy.

## SPONSOR SAFETY CONVENTION

NEW YORK—More than 6,000 safety engineers, plant executives and police and fire officials will participate in the Tenth Annual Safety Convention, sponsored by the Greater New York Safety Council, to be held March 27–29 at the Hotel Pennsylvania.

With more than 100 speakers at the convention's thirty-eight sessions, the convention program will cover virtually every phase of accident prevention work.

# WATCHING WASHINGTON

McGraw-Hill Washington Bureau
PAUL WOOTON, CHIEF

Attention centers on various national defense measures which are rapidly being pushed to completion. Additional aircraft facilities on West Coast are asked

WASHINGTON — National defense measures are moving rapidly toward enactment. The House Military Affairs Committee has completed hearings and reported the May bill, which the House passed Feb. 15, authorizing immediate construction of 5,500 airplanes instead of 1,000 a year, which action was urged by the conservative minority. The House Naval Affairs Committee, as this is written, is preparing to report the naval base bill. The House Military Affairs sub-committee has finished hearings on the 1940 War Department appropriation. All measures will meet spirited but futile opposition in the Senate, where there is resentment against Mr. Roosevelt's purge, his recent "offensive" appointments, and his stand for airplane sales to France.

## Educational Orders Awards Near

Only a few legal and other details remain to be settled before the War Department issues awards on proposals on the six educational orders items. It is not yet known whether bids will be invited on any more items in the fiscal year 1939. The $34,500,000 called for in the defense bill is for expenditure in 1939, 1940 and 1941. For five years following 1941, the appropriations would be $2,000,000 a year, as provided in last year's legislation.

## Discount Importance of Plane Crash

Blasts against the President arising from the Douglas accident that spilled the Frenchman can be largely discounted as opportunist politics by isolationists who oppose the armament program. Most now believe that Mr. Roosevelt did make some remark about our frontier being overseas, but if so, he said it in confidence. England and France can buy all the equipment they want.

## Exports of Direction Finders Explained

Why anti-aircraft direction finders are being sold to England was explained by the President in a press conference. British Vickers developed the most effective detector. Sperry Gyroscope acquired Vickers rights. Later on it was deemed economical to permit export back to England as an aid to building up American production. The detector is, *per se*, a defensive weapon, and there can be little objection to selling it to non-aggressors.

## Demand Additional Aircraft Facilities

National Advisory Committee for Aeronautics, the nation's aviation laboratory, is asking Congress for $4,000,000 cash and $6,000,000 contract authority to supplement Langley Field, Va., with a new station at Sunnyvale, Calif. The object is to better serve the industry on the West Coast, which now produces about 60 per cent of the total aircraft. N.A.C.A. believes that Germany is neck and neck with us technologically, they know she has research facilities vastly greater than ours, that she may "give us the dust" if we don't snap to it. Therefore $2,140,000 is asked to expand aerodynamic equipment at Langley. Lines of development planned by N.A.C.A. are strictly secret, but it is known that wind tunnel work must be stepped up to meet new problems of increased speed and size and that aircraft structure study is needed.

### EYES ON AMLEE

Manufacturers and business men whose own course may be modified by whether the Administration swings more to the left or more to the right in the next 18 months would do well to watch developments on the Thomas Amlee case. Amlee is the radical nominated by President Roosevelt for the Interstate Commerce Commission.

The important thing is whether the President withdraws his name, for there is virtually no doubt that if Roosevelt persists in the fight Amlee will be defeated. Democratic leaders on Capitol Hill have high hopes that in Secretary of Commerce Harry Hopkins they have a real ally in their drive to force the Administration a little further to the right. They have told Hopkins that Amlee cannot be confirmed, and urged him to persuade the President not to force a showdown.

Assuming they are right about Hopkins, this will be the first time that Hopkins will have fought on the conservative side in one of these tugs of war which are continually going on among the President's advisers. It will be the first time he will have opposed Marriner Eccles, Harold Ickes, Corcoran and Cohen, and company. It will also, according to the senators, be the first time that Hopkins has opposed Mrs. Roosevelt, whom they are convinced had more than a little to do with the nomination of Amlee.

## Destroyer Turbine Failure

Information here is that the Navy's new destroyer *Benham* ran one of the most satisfactory shakedowns ever known in the Department. The slight failure found when turbine castings were lifted cannot be detailed for publication, but it is merely incidental to progress in the use of high temperature and high pressure boilers, and the trouble will be easily remedied. The Navy is now far ahead of conventional marine practice in high heat and pressure boilers, but still far below shore stationary practice. Those "in the know" say that the old low temperature-pressure school is slowly but surely losing ground.

## Itching to Show Up N.L.R.B.

Conciliation Service of the Labor Department is watching for an opportunity, amid the strife that surrounds the Labor Relations Board, to jump in and show Congress how it settles quarrels without force of law. Labor Department officials say privately that Secretary Perkins is far less ardent for the N.L.R.B.-C.I.O. combination than she was a couple of years back when she asked (but didn't get) power of subpoena to jerk unwilling employers onto the carpet. How far labor will get in its turn-around bid for more mediation responsibility will depend on what happens to the Wagner Act. Lewis might be able to stop the A.F.L.-conservative drive in Congress for amendments, if he would ask Roosevelt to put a business man in place of Donald Wakefield Smith. But opinion is he won't see it that way. If the Board and the Act continue as they are now, you can watch for Conciliation's star to rise. It might rise anyway, if the Board or the Act is closely dehorned.

## Steel-Wage Investigation Out

Independent steel producers' request to the anti-monopoly committee to investigate recent wage determinations by the Labor Department will get nowhere, is the majority opinion here. This move is regarded by some observers, even pro-steel men, as just another sadistic gesture at Secretary Perkins who has been a popular goat in Washington for the last two years.

## MACHINE TOOL INDEX UP

CLEVELAND—The index of machine tool orders, compiled by the National Machine Tool Builders Association, has advanced 4 points during the past month to stand at 150.8 for January. The three months average index has advanced almost 7 points to 136.5, well above the same index of 129.6 a year ago.

Special significance is attached to the continued strength in the domestic demand for machine tools, officials of the association pointed out.

## WORLD'S SPEEDIEST TANKER FORMALLY ACQUIRED BY NAVY

WASHINGTON—The Navy Department has formally acquired the new tanker *Cimarron*, said to be the fastest ship of her type in the world.

She was built for the Standard Oil Co. of New Jersey at a contract price of over $3,000,000, of which the Maritime Commission paid $880,250 for her national defense features. These included high speed, equipment for fueling at sea, and other items necessary to her use as a naval auxiliary.

Developing 16,900 hp., the *Cimarron* has reached over 19 knots during test runs and has a cruising radius of approximately 10,000 miles. She is the first of the series of twelve identical tankers to be launched, and the first of two bought from the Standard Oil Co. by the Navy. The ships are of 553 ft. overall length, 75 ft. beam, and 25,000 tons displacement.

## FOR EXTENDED PLANE MAKING

WASHINGTON—The House Military Affairs Committee is considering spreading the proposed military aviation expansion program over several years in order to prevent the country's armed forces from accumulating "a surplus of obsolete planes." Chairman May revealed it had been suggested that the Army be limited to buying 500 planes annually over a 4-year period. With the 1,880 planes already authorized, such a plan would give the Army a total of 6,000 planes, of increased usefulness.

## "WASPS" FOR THE BRITISH

HARTFORD—The British Government has placed an order with the United Aircraft Corp. for Pratt & Whitney engines and Hamilton Standard constant propellers to be installed in 200 North American training planes for British use. The engines are 9-cylinder 600-hp. "Wasps".

**Sea Wasps Grow Wings**—*Navy fighters under construction at the Santa Monica plant of the Douglas Aircraft Co. Plans for greatly increased production proposed by President Roosevelt for national defense have been worked out by Douglas officials and can be set in motion with a minimum of delay*

# SEE NO COMPROMISE IN U.A.W. BATTLE

By FRANK RISING

*Labor Editor, American Machinist*

DETROIT—Too tough even for the courts and the National Labor Relations Board to figure out, the war between Homer Martin and his former executive board apparently will have to be fought out to the bitter end of employee elections and majority-minority splits. It is a generally-expressed belief that management would do well to reserve opinion and back no favorites prior to the two scheduled conventions of the "United" Automobile Workers.

The difficulty of estimating relative strength of the Martin and C.I.O. camps is seen in the caution with which Detroit courts and the regional N.L.R.B. offices have handled complaints of the rival groups against each other. Gingerly the adjudicators have postponed action and discouraged further appeals. Giving the paper title to U.A.W. to either side would mean little before a rank-and-file test can be had.

### U.A.W. Repeats Itself

Offhand, however, a good guess is that Martin will hold about 30 per cent of the U.A.W. membership, and that Sidney Hillman and Philip Murray will keep the rest in C.I.O. Martin will turn up with minorities in a number of locals, majorities in a few. After the two conventions (Martin's set for March 4 in Detroit and the C.I.O.'s set for March 27 in Cleveland), both will claim to be the only true U.A.W. and one side eventually will have to take another name. Then the employers can have the job of bargaining with two or more sets of employee representatives or of recognizing one side and ignoring the other.

### A.F.L. Eyes on Martin

Meanwhile, American Federation of Labor organizers in Detroit and other automotive manufacturing centers are getting a few converts who are fed up both with Martinites and anti-Martinites. These have not been many, and the A.F.L. has made no formal move to make hay while the rain pours, but the possibility exists of a bid for friendship with Martin if he should manage to weld together a good-sized union. If he takes as much as a third, or even a fourth, of U.A.W., and then gets a welcome at Ford's (which isn't a pipe dream), Martin would have a union worth A.F.L. consideration.

If the federation were willing to grant industrial union autonomy to such a group, swearing never, never to chop it up into 27 crafts, the boys might go along. If, however, the craft unions have only apprenticeship standing to offer, as they did in 1934, they might as well save their breath. Whether the automobile workers are for Martin or against him, they are industrial unionists, and nine out of ten of them are personally and profanely inimical to the idea of dividing into crafts. What's more, Martin himself feels that way.

H. P. LADDS

L. B. McCULLY

W. A. MARSHALL

## PERSONALS

HERBERT P. LADDS, president Sweet's Steel Co., Williamsport, Pa., has been elected president and a director of the National Screw & Mfg. Co., Cleveland, Ohio. Mr. Ladds is resigning from the steel company to assume his executive duties with National Screw & Mfg. Co. about March 1.

L. B. McCULLY, former superintendent of the generator division, Westinghouse Electric & Mfg. Co., has been appointed manager of the recently combined transportation and generator divisions. He succeeds F. H. STOHR, whose appointment as manager of the company's industry sales department was announced in *American Machinist* Feb. 8.

Mr. McCully enrolled in the Westinghouse apprentice course in 1916, and shortly thereafter was assigned to a machining department as a production clerk. By 1927, he was assistant superintendent of production for the entire East Pittsburgh works. Two years later, he was appointed head of production and in 1935 was promoted to assistant superintendent of the generator division.

E. O. BEHNE, formerly connected with the Defiance Machine Works, Defiance, Ohio, has joined the staff of the Reed-Prentice Corp., Worcester, Mass., as chief engineer in charge of engineering and development.

C. HASCAL BLISS, vice-president Nash-Kelvinator Corp., Kenosha, Wis., has resigned.

KEITH C. BOWERS, formerly of the St. Louis office, Revere Copper & Brass, Inc., has been appointed sales representative in western Missouri and Kansas.

C. G. CUNNINGHAM, Pratt & Whitney Div., Niles-Bement-Pond Co., has been elected president of the Machinery Club of Chicago. Also elected were V. R. CLARK, V. R. Clark Belting Co., vice-president, and A. W. SMITH, L. S. Starrett Co., secretary-treasurer.

WILLIAM A. MARSHALL, former superintendent of construction at the Irvin works, Carnegie-Illinois Steel Corp., Pittsburgh, Pa., has been appointed superintendent of maintenance. WARREN W. SCHERER and ARTHUR M. KRIEGER have been made assistant superintendents of maintenance.

WILLIAM F. CUMMINGS has been promoted to chief engineer of the Boston & Maine Railroad, the Maine Central Railroad Co., and the Portland Terminal Co. Mr. Cummings succeeds ASA H. MORRILL, deceased

JOHN S. DEAN, transportation maintenance engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has retired after 36 years of service. Mr. Dean is the author of several books dealing with electric railway maintenance and operating problems, and has been a consistent contributor to electrical and railway trade journals.

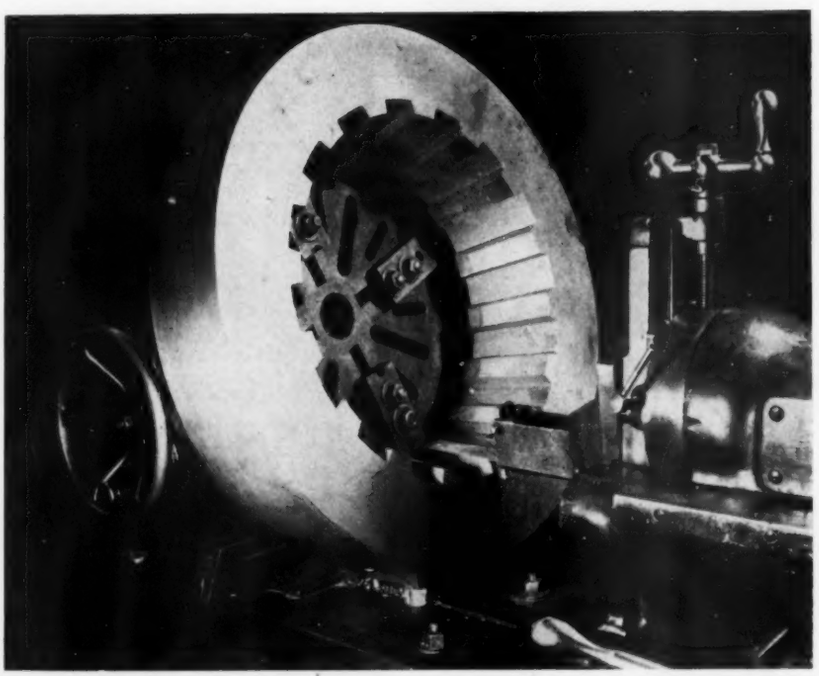
L. A. DELANEY, former superintendent, Baldwin-Southwark Corp., Philadelphia, Pa., has been named mill superintendent, William B. Scaife & Sons Co., Oakmont, Pa. He succeeds CHARLES E. NEUDORFER, who has been appointed chief engineer.

WILLIAM P. EWING, vice-president Superior Steel Corp., Pittsburgh, Pa., has been elected a director. He succeeds DAVID PRYDE, who will continue as vice-president in charge of operations.

JOHN A. JOHNSON, president, treasurer and general manager, Kuhlman Electric Co., Bay City, Mich., was awarded a certificate honoring his 50 years of service in the electrical industry by the National Electrical Manufacturers Association at that organization's recent banquet in New York City.

R. E. GREENWOOD has been appointed Chicago district sales manager, American Chain Div., American Chain & Cable Co., Bridgeport, Conn. He sceeds G. B. KUTZ who has been transferred to York, Pa., as assistant to the general manager of sales. Mr. Greenwood's place as Philadelphia district sales manager will be filled by R. C. BRENIZER.

A. R. HERSKE, since 1934 vice-president and general manager of the American Radiator Co., New York, N. Y., has resigned.



**Time-Saving Tooling**—*Timken Roller Bearing Co. saved considerable time in cutting the pockets in this die by using a 16-in. shaper. Said to be the largest ever cut by this method, the 580-lb. die is used for making cages for large mill bearings*

FREDERICK W. COPELAND has resigned as president of the H. Channon Co., Chicago, Ill., to assume the presidency of the Sullivan Machinery Co., Michigan City, Ind.

Mr. Copeland was previously connected with the Sullivan organization, having joined their staff in 1913. In the 21 years which followed, he worked successively as apprentice in each plant, service man, salesman, export manager, vice-president and controller. He has been a director of the company since 1923. In 1934 he left to become president of the Channon concern.

F. MALCOLM FARMER, vice-president and chief engineer, Electrical Testing Laboratories, New York, N. Y., has been selected by the national nominating committee of the American Institute of Electrical Engineers as president for the term beginning August 1, 1939.

ELMER C. KIEKHAEFER, former chief engineer Stearns Magnetic Mfg. Co., has joined the Kiekhaefer Corp., Cedarburg, Wis. as vice-president in charge of engineering.

LESTER A. LANNING, chief metallurgist New Departure Div., General Motors Corp., Bristol, Conn., has been promoted to assistant plant manager. JOHN C. KIELMAN, former assistant superintendent of New Departure's heat-treating division, has been appointed superintendent.

ROBERT R. MCMATH, president Motors Metal Mfg. Co., Detroit stamping manufacturer, has been elected chairman of the board. He is succeeded by STEVEN J. MENZEL, former vice-president.

NELSON H. NORRIS, formerly associated with Veeder Root Co., Hartford, Conn., has been made general manager of the Marathon Steel Specialties Corp., Marathon, N. Y.

DONALD B. PATTERSON, Chicago district sales manager Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., Muskegon, Mich., has been named general hoist sales manager. He succeeds G. A. MITCHELL, who has been made sales promotion manager.

DWIGHT G. PHELPS, vice-president Colt's Patent Fire Arms Mfg. Co., Hartford, Conn., has been elected a director to succeed the late FREDERICK T. MOORE.

A. J. RAITCH, has been named manager of the new Arthurdale, W. Va., plant of the Arthurdale Farm Equipment Corp., which will be used for the manufacture of "Co-Op" tractors formerly built in Battle Creek, Mich.

GEORGE F. WALES, for the past 15 years chief engineer of the American Radiator Company's stamping plant at Buffalo, N. Y., has resigned. He will head the management of the Strippit Corp., Buffalo, of which he is president and founder.

F. W. COPELAND

W. A. HUBER

L. R. KELLS

W. A. HUBER has been appointed manager of sales, Gilmore Wire Rope Div., Jones & Laughlin Steel Corp., Pittsburgh, Pa. Mr. Huber has been with J. & L. since 1936, and prior to that time was engaged in public accounting and sales work.

L. R. KELLS has been appointed chief engineer Salem Engineering Co., Salem, Ohio, industrial furnace manufacturers.

W. D. ENDRES has been appointed sales manager in charge of the Merchandise Tool Div., Billings & Spencer Co., Hartford, Conn., forging manufacturer. He succeeds W. ROY MOORE, who resigned recently.

LOUIS J. GALBREATH has been appointed technical adviser, New York District Sales Div., Revere Copper & Brass, Inc.

L. E. PECK has been made midwest district sales manager, Lake Erie Engineering Corp., Buffalo, N. Y., hydraulic press manufacturer.

W. G. RETZLAFF has been appointed assistant general manager of the Fruehauf Trailer Co., Detroit, Mich.

A. F. SCHOEPFLIN, formerly associated with the Doehler Die Casting Co., is now employed by the Reed-Prentice Corp., Worcester, Mass., as consulting engineer.

PHILIP B. STANLEY, a director of the Stanley Works and of the New Britain Machine Co., New Britain, Conn., has been elected a director of the Phoenix Fire Insurance Co., Hartford, Conn.

FENTON B. TURCK, JR., vice-president American Radiator & Standard Sanitary Corp., New York, N. Y., has resigned.

HARRY VARLEY, president Schick Dry Shaver Co., Stamford, Conn., has resigned.

ODBERT P. WILSON, vice-president and treasurer, Norma-Hoffman Bearings Corp., Stamford, Conn., has been elected a director of the Connecticut Power Co. He succeeds the late ALFRED W. DATER.

## BUSINESS ITEMS

American Flexible Coupling Co., Erie, Pa. has appointed M. H. JEWETT, Cleveland, Ohio as its northern Ohio sales representative.

American Radiator & Standard Sanitary Corp., New York, N. Y., as of Feb. 1, has unified the operation of six subsidiaries, the corporation announced recently. The products of these companies will henceforth be manufactured and marketed by the parent company under their present trademarks. The organizations affected are the American Radiator Co., Standard Sanitary Mfg. Co., American Gas Products Corp., Ensign-Reynolds, Inc., Excelso Products Corp. and Fox Furnace Co.

Bendix Aviation Corp., Chicago, Ill., has purchased land in Baltimore, Md. for the erection of a new factory. To be completed by next summer, the new plant will cost $500,000.

Chase Welding Supply Co., Benton, Ill., has been appointed by the Air Reduction Sales Co., New York, N. Y. as an authorized dealer for "Airco" welding and cutting apparatus and supplies.

Elcar Coach Co., Elkhart, Indiana, has purchased the assets of the Lee Trailer Co. and the equipment of the Harris Caravan Coach Co., Plymouth, Ind. FRED J. HIBBS, former Elcar plant assistant manager, will be in charge of the Lee plant in Plymouth.

Fray-Mershon, Inc., Glendale, Calif., tool manufacturer, has appointed the W. W. Brazier Co., Los Angeles, as its exclusive factory representative.

Howard Aircraft Corp., Chicago, announce that a million dollar issue of its common stock has been underwritten and that expansion of its factory will begin immediately. It is planned to begin production of aircraft as large as those now used by commercial airlines in addition to the present small single engine planes being produced. The company was

founded by BEN O. HOWARD. It is also announced that B. C. DEWEESE has been appointed executive vice-president and general manager. Until recently he was head of the Stinson Aircraft Corp.

Industrial Sales & Engineering Co., Philadelphia, has been appointed Philadelphia district sales representative for the American Flexible Coupling Co., Erie, Pa.

International Meehanite Metal Co., Ltd., London, England, subsidiary of Meehanite Metal Corp., Pittsburgh, has licensed C. A. Parsons & Co., Ltd., Newcastle-on-Tyne, England, to manufacture Meehanite metal.

D. D. Mills Machinery Sales, 7360 Richmond St., Detroit, has been established by D. D. MILLS to sell both used and new equipment, the latter including Superior and Eklind vertical milling machines and Hydraulic Duplicater milling machines. Mr. Mills will be assisted by C. E. FALES who operated one of the earliest machinery houses in Detroit, having been in business under the name of Fales Machinery Sales from 1910–1931.

D. J. Murray Mfg. Co., Wausau, Wis., has acquired the manufacturing rights to the Meyer-Moloch power-driven forge hammer. These hammers, available in five sizes up to 500-lb. ram weights, are now being made under the Murray trade mark.

Northern Automotive Supply Co., Saginaw, Mich., has been appointed distributor for the New York Belting & Packing Company's line of mechanical rubber goods.

Peck Spring Co., Plainville, Conn., has acquired the Newton Mfg. Co., manufacturer of aluminum screw machine products.

The Peerless Pump Co., Los Angeles, Calif. is erecting additions to its office and factory facilities. Total costs will approximate $17,500.

Reliance Steel Corp., Cleveland, Ohio, has acquired the Youngstown plant of the Sheet Metal Mfg. Co. The plant will be operated by THOMAS J. FITZGERALD, former vice-president.

Ryan Aeronautical Co., San Diego, Calif., sport plane manufacturer, has begun construction of an additional floor to its administration building, and is planning extensive enlargement of its factory and installation of considerable new equipment, it was announced recently by T. CLAUDE RYAN, president.

Standard Steel Works Co. announces that its general sales department has been transferred from Burnham, Pa., to Eddystone, Pa.

Van Norman Machine Tool Co. has appointed the Marshall & Huschart Machinery Co., Chicago, as its exclusive representative in the Chicago territory.

## OBITUARIES

GEORGE DAWE

GEORGE DAWE, president Robins Dry Dock & Repair Co. and vice-president in charge of operations, Todd Shipyards Corp., New York, N. Y., died Feb. 9 of a heart attack in Miami Beach, Fla. He was 58 years of age.

Mr. Dawe started with the Robins concern 45 years ago as a boiler scaler. He next became a rivet passer, and later was given the job of heating rivets. Promotion followed in order of "snapper," superintendent, vice-president and finally president of the Robins organization.

HARRISON J. L. FRANK, Detroit, Mich., president American Society of Engineering and president of the Bulldog Electric Products Co., Detroit, Mich., died Feb. 14 in a Miami Beach hospital following a short illness. He was 59 years of age.

WILLIAM LARCHAR, partner Larchar-Horton Co., Providence, R. I., died Feb. 3.

SAMUEL R. SEYFERT, 83, a director of the Reading Iron Co., Reading, Pa., died Feb. 13 at his home in that city.

REGINALD B. PALMER, president and founder, Palmer Spring Co., Providence, R. I., died recently. He was 42 years of age.

RAY A. NORTH, for the past 24 years president Green Bay Foundry & Machine Co., Green Bay, Wis., died Jan. 12, at the age of 66.

RICHARD B. SHERIDAN, former president Brown Hoisting Machinery Co. and more recently associated with the Allied Machinery Co. and the New York Air Brake Co., died Jan. 21 at his home in Ossining, N. Y.

ALLEN E. OSTRANDER, assistant vice-president American Car & Foundry Co., New York, N. Y., committed suicide Jan. 29 in a New York City hotel. He was 61 years of age.

BURTON M. PHEATT, stamping division sales manager of the Murray Corp. of America, Detroit, died Feb. 1 at a hospital in that city.

HOWARD L. FLETCHER, former superintendent of the Flint spring plant, General Motors Corp., died after an illness of several months. He was 50 years of age.

ERICK O. SJODEN, former manager of the Elmwood Ave. plant of the American Radiator Co., Buffalo, N. Y., and inventor of molding machinery used by the company during the war for munitions manufacture, died at his Buffalo home. He was 72 years old.

EDWARD C. ROOT, 66, president Root Mfg. Co., Cleveland, Ohio, farm implements manufacturer, died Jan. 30 following a brief illness.

FREDERICK C. WHITE, former superintendent Otis Elevator Co., Yonkers, N. Y., died Jan. 31 at his home in that city. He was 66 years of age and had served the company for 40 years.

WALLACE D. WALKER, who last March succeeded his father, LEWIS D. WALKER, as president of Talon, Inc., Meadville, Pa., slide fastener manufacturer, died of a heart attack Feb. 4. He was 51 years of age.

ALFRED R. BROWN, 49, eastern sales manager Johns Conveyor Div., Osborn Mfg. Co., Cleveland, Ohio, died Feb. 7 in East Orange, N. J.

## MEETINGS

AMERICAN MANAGEMENT ASSOCIATION. Ninth annual conference and exposition of packaging, packing and shipping, Hotel Astor, New York, N. Y., March 7–9.

AMERICAN RAILWAY ENGINEERING ASSOCIATION. Annual meeting, Palmer House, Chicago, Ill., March 14–16. W. S. LACHER, Secretary, 59 E. Van Buren St., Chicago, Ill.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Spring meeting, St. Charles Hotel, New Orleans, La., Feb. 23–25.

AMERICAN SOCIETY OF TOOL ENGINEERS. Annual meeting and Machine & Tool Progress Exhibition, Convention Hall, Detroit, Mich., March 14–18. FORD R. LAMB, executive secretary, Room 428 Boulevard Temple Bldg., 2567 W. Grand Blvd., Detroit, Mich.

ASSOCIATION OF IRON AND STEEL ENGINEERS. Annual Spring conference, Hotel Tutwiler, Birmingham, Ala., March 27-28.

MOTOR AND EQUIPMENT MANUFACTURERS ASSOCIATION. Automotive maintenance show, Palace of Fine Arts, San Francisco, Calif., Feb. 23–26. Manager, J. M. Noble, 1243 S. Hope St., San Francisco, Calif.

SOCIETY OF AUTOMOTIVE ENGINEERS. National aeronautic meeting, Washington, D. C., March 16–17.

# SHOP EQUIPMENT NEWS

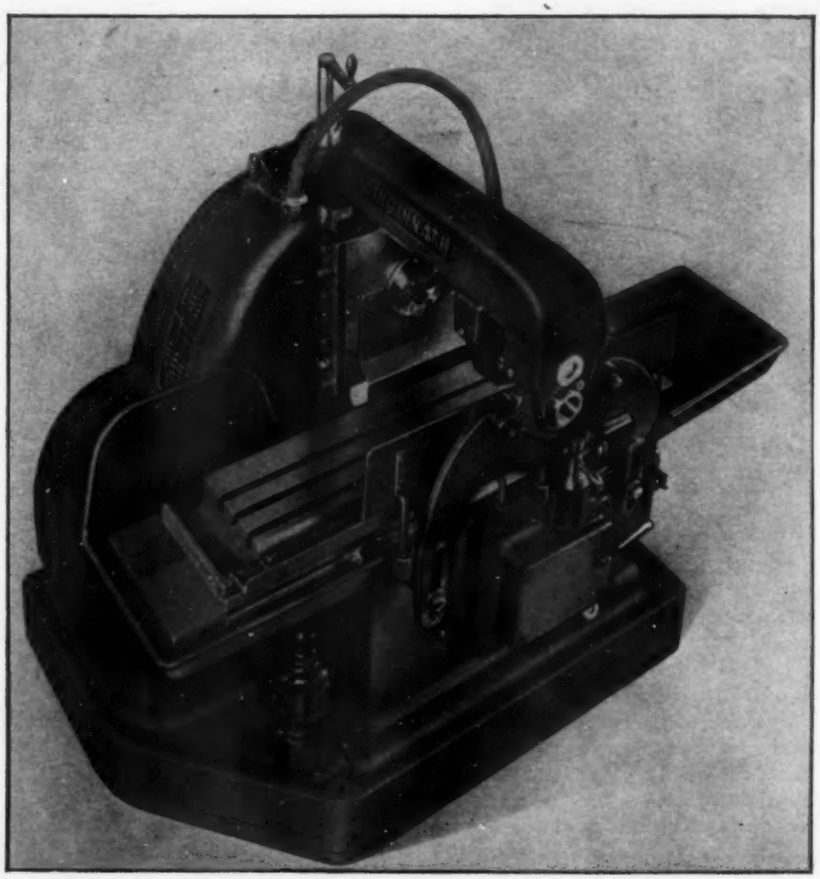
## Plain Millers Designed for Rapid Production

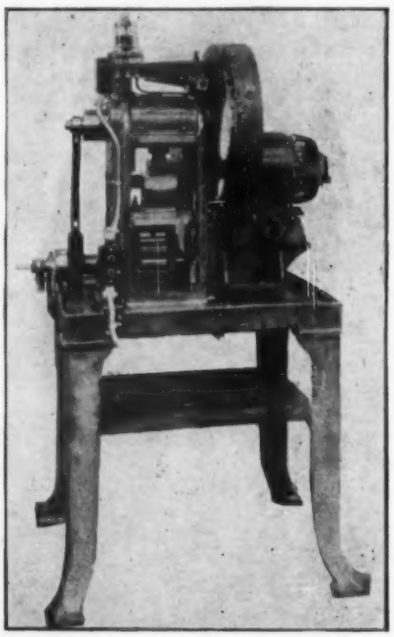
The No. 2-18 and No. 2-24 plain automatic milling machines announced by the Cincinnati Milling Machine and Cincinnati Grinders, Inc., Cincinnati, Ohio, are designed for the rapid production milling of medium sized work. Of the fixed bed type and available with a table travel of 18 or 24 in., these machines are powered with a 5 hp. motor. To permit maximum machining efficiency, these machines feature 20 spindle speeds ranging from 30 to 1,200 r.p.m., and 16 feeds ranging from 1 to 40 in. per min.

Spindle speeds are selected by pick-off gears and a back gear lever. The gears are readily accessible and are secured by large nuts to exact alignment on the steep angle ground tapers. Only four gear contacts are made in the complete anti-friction spindle drive unit, and a double mounting of anti-friction bearings for the spindle, both front and rear is claimed to insure spindle alignment. Mounted on a hinged plate, the driving motor is connected to the drive pulley by multiple V-belts.

An automatic spindle stop, actuated at the termination of the table feed by a dog and plunger, throws out the multiple-disk friction driving clutch and applies the spindle brake while the table is reversing. This safety feature protects the operator while loading and unloading, and prevents cutter marks on the work.

The standard series of table feeds are obtained by pick-off gears. Dog controlled, automatic working cycles with intermittent feeds for the table, in either direction, permits accurately tripping the table at the point of reversal within 0.005 in. A dog-controlled power rapid traverse of 250 in. per min. is standard equipment. These machines weigh approximately 4,500 lb. each.





## No. 0 High Speed Press First of New Series

The Waterbury Farrel Foundry & Machine Co., 425 Bank St., Waterbury, Conn., has announced the development of the No. 0 high speed blanking press; the first in an anticipated series of sizes. It has a capacity of 4 tons and is especially intended for blanking and forming, or pressing, on a quantity production basis. It operates smoothly at speeds ranging from 300 to 900 r.p.m. This press is equipped with a rear roll feed of standard type, which is adjustable for height and is removed easily to give access to the tools, front or back. The feed is fitted with a gate-actuated roll release so that ordinary piloted hollow tools or

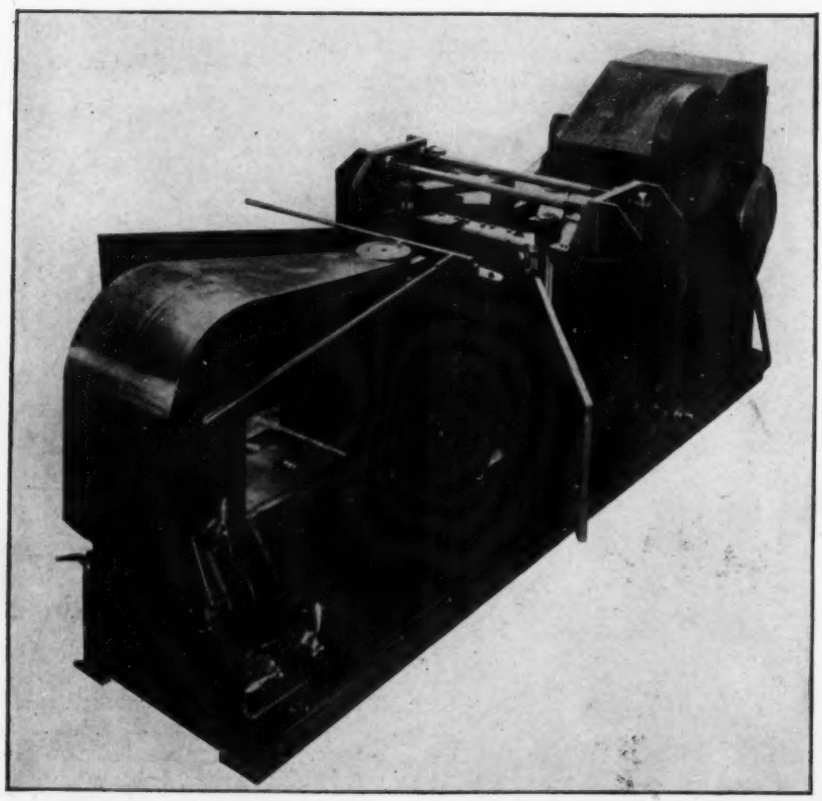
standard die sets can be accommodated.

Driven by belt direct from the motor pulley to the flywheel, with provision for regulating the speed by means of a standard variable speed device this blanker is started by push-button and stopped from either front or back by a handle which opens a limit switch in the circuit and, at the same time, applies a brake to the inside of the flywheel flange. Maximum speeds are recommended only for use with short feeds, the operating speed being adjusted in accordance with the length of feed.

Specifications: Standard stroke $\frac{3}{4}$ in.; maximum stroke $1\frac{1}{4}$ in.; clearance between guide posts, $6\frac{1}{4}$ in.; distance from center of gate to roll feed frame, $3\frac{5}{8}$ in.; distance from feed line to bed of press, $2\frac{1}{2}$ in.; maximum feed, 2 in.; size of feed roll, 1.6x3 in.; floor space required, $30\frac{1}{2}$x40 in.; height 64 in.; net weight 1,075 lb. A 1 hp., 1,750 r.p.m. motor is used.

## Tangent Bender Uses Guided Flat Shoe

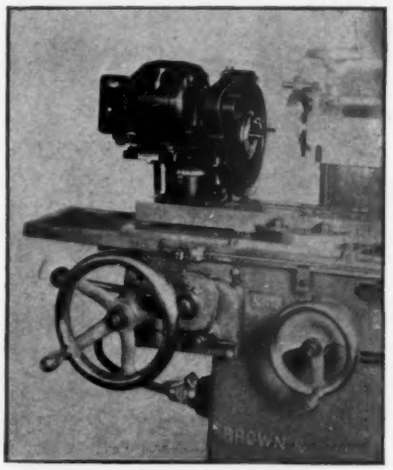
Steelweld Div., Cyril Bath & Co., Cleveland, Ohio, has developed a tangent bending machine for forming curved sections of flanges, tee or channel shaped members or tubing with a minimum of distortion or wrinkling of the material. Developed originally for forming refrigerator cabinets, this bender is arranged to roll a guided flat shoe around the material being formed, and to encase the material while the action is in process. Use of the flat shoe, instead of rolls, is claimed to eliminate the formation of wrinkles. A universal tool, adaptable in different sizes to a variety of bending problems has been developed for use with this machine.



In operation, the material is placed in the machine, then the rear moving member, or blank holder, moves forward and locks the sheet into position in a curved die. Operating from the other end of the machine, a second plunger then forces the guided shoes around tangent plates, which simultaneously rock over the two radii. The tangent plates then roll back into position ready to receive the next sheet. When the blank holder has been returned to the loading position an air cylinder withdraws a lockpin and the die holding element in the blankholder revolves to a 90 deg. angle with the bed for unloading the finished shell.

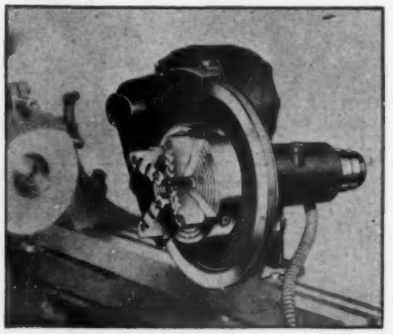
## Headstock Attachments Made for Tool Grinder

Available as an attachment for use on the No. 10 cutter and tool grinder, this revolving spindle headstock announced by Brown & Sharpe Mfg. Co., Providence, R. I., is individually motor driven by a single V-belt from a $\frac{1}{4}$-hp. constant-speed motor mounted on the attachment. The centers will swing work up to 10 in. in diameter and take 17 in. length. Miscellaneous chucking operations are made possible through the use of a 4-in. diameter four-jaw independent chuck which can be mounted quickly on the face of the spindle pulley in place of the work driver.




*The revolving spindle headstock for the No. 10 B & S cutter and tool grinder is motor driven*

Spindle speed is 300 r.p.m. when using a 60-cycle a.c. or a d.c. motor. Motor position is adjustable to provide proper belt tension and a belt



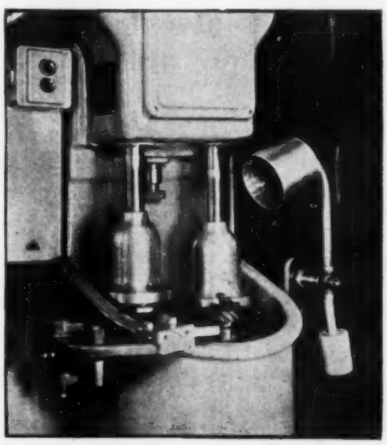
*A four-jawed independent chuck can be mounted on the pulley of the B & S revolving spindle headstock in place of the work driver*

guard protects both the belt and the motor pulley. The headstock swivels on its base and may be set at any angle in a horizontal plane, the setting being indicated by a scale graduated to 100 deg. at each side of zero. The base is aligned accurately on the swivel table of the machine by means of two tongues, and is clamped in position by two T-bolts. A $\frac{7}{16}$-in. hole through the spindle permits using a rod to knock out the center. Net weight is 62 lb.

## Two-Spindle Lapper For Gears and Splines

Developed for high-speed lapping of gears not more than $4\frac{1}{2}$ in. in diameter, worms and splines, the "Incolap" two-spindle lapper offered by Gear Processing, Inc., 6700 Grant Ave., Cleveland, Ohio, is claimed to correct gears properly cut with the normal amount of production error. The "Incolap" process is not designed to remove large amounts of stock.

The process is simple. It depends on the averaging effect of a reciprocating lap. All teeth of a gear are lapped simultaneously. The primary function of the machine is to reciprocate the gear and surrounding lap in relation to each other; the two-spindle machine reciprocating the lap outside the stationary gear. Only reasonable accuracy is necessary in the production of the lap, since they automatically true up after a few minutes of use. By the use of thin laps, close clearance gears can be finished provided there is at least $\frac{1}{8}$ in. space between the gears being lapped and the adjacent gear or shoulder. The laps usually are made from chilled iron castings, and usually are slightly oversized, so that the gear may enter the lap easily.



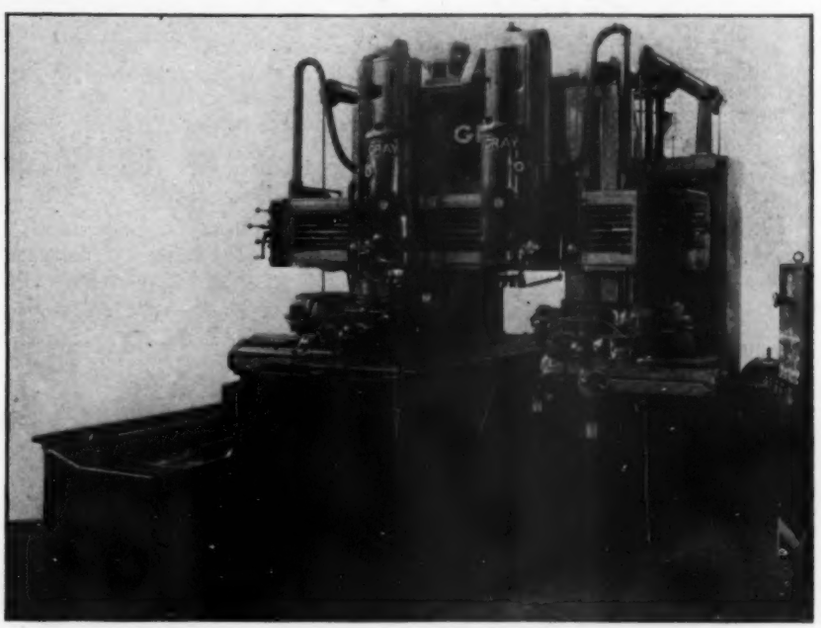
## Gisholt Collet Chuck Uses Ground Pads

Collet chucks of improved design for use on No. 3, 4, and 5 ram type universal turret lathes, and on No. 1L, 2L, and 3L high-production turret lathes, have been announced by the Gisholt Machine Co., Madison, Wis. These chucks have capacities up to $2\frac{1}{2}$ in. diameter for the ram type machines and up to $4\frac{1}{2}$ in. diameter on the high production machines. In order to remove pads from the chuck it is only necessary to slip off the light aluminum chuck guard, after loosening a thumb screw, and take out the cap screws that hold the pads in place. This chuck is of the push-out type, and employs a four-jaw master collet provided with four accurately ground collet pads which hold the bar material accurately on center. Holes through the collet hood permit the removal of pad screws and the changing of collet pads without removing the hood from the spindle.

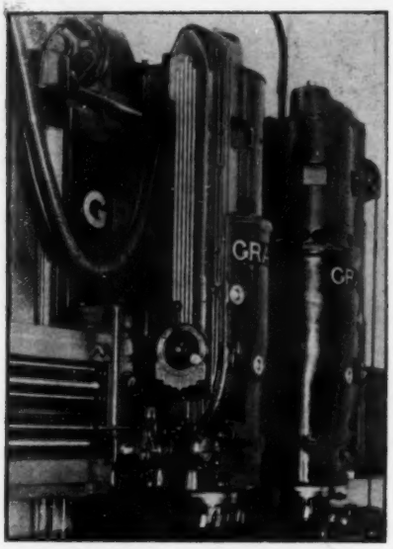
## Gray Miller Has Motor-Driven Heads

The G. A. Gray Co., 3611 Woodburn Ave., Cincinnati, Ohio, has announced development of a unit-head planer type milling machine on which the milling heads are individual units, each driven by its own self-contained motor. This arrangement offers flexibility of operation and permits running two or more heads at different speeds at the same time. The individual motor-driven head is claimed to make possible a more rugged spindle drive for swiveling heads. The standard spindle motor is an a.c. two-speed type of 10 hp. capacity, mounted concentric with the spindle and transmits power directly to the spindle through planetary gearing.

A compact arrangement of the planetary gearing affords 18 spindle speeds in geometric progression ranging from 10 to 500 r.p.m. for 60 cycle supply and from 8 to 420 r.p.m. for 50 cycle supply. The speed is changed at the head by means of



*The bed of this Gray planer-type miller is of double length; the table does not overhang even when the center line of either vertical or horizontal spindles is at the end of the table*



*Individually-driven cutter heads on the Gray miller can be controlled independently*

two levers without stopping the motor. Spindles run in double-opposed pre-loaded precision Timken bearings and are driven by a planet-carrier at a point close to the cutter.

Rail heads may be furnished either swiveling or non-swiveling, while the side heads always are of the non-swiveling type.

Standard quill travel of both rail heads and side heads is 10 in. The standard milling feeds for the table, rail heads and side heads are from ½ to 30 in. per min. Range of power downfeed and upfeed of the rail heads is from ⅛ to 7½ in. per min. The feed and rapid traverse of any head can be engaged or disengaged without affecting the feed or rapid traverse of any other head or of the table. These movements can be engaged or disengaged at each head.

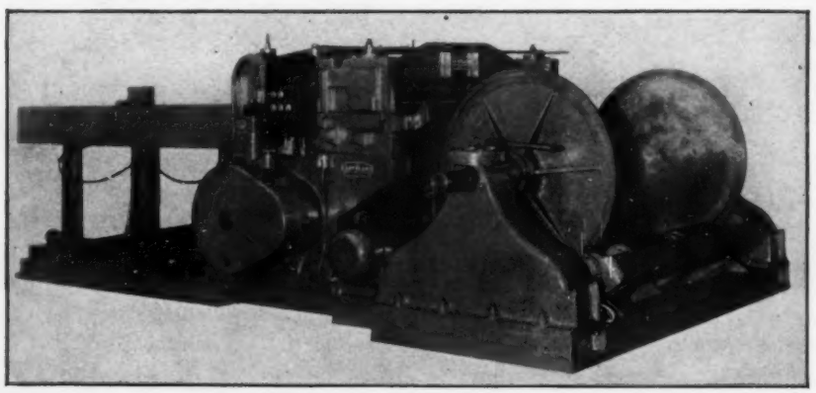
The "stub shaft" spiral geared drive employed for the table is claimed to provide smoothness of motion and to be self-locking under all conditions. Rail of this milling machine is of a box-section adjustably mounted on the housing with provision for adjustment so as to keep it level and square with the housing. The rail is automatically leveled before clamping, whether it be furnished with regular hand-clamping, or power clamping.

## Cut-to-Length Shear Has Roll Leveler

Having capacity to handle stock ranging from 24 to 78 in. wide, the automatic cut-to-length shear developed by the Cleveland Punch and Shear Works Co., 3900 St. Clair Ave., Cleveland, Ohio, is arranged with an uncoiler, five roll leveler, and feed rolls. A discharge table located at the back of the shear holds the sheet in position until the cut is made, at which time the discharge automatically is tripped and the sheet dropped into a buggy which is placed in the stacker. This shear is of the down cut type, the eccentric shaft by which the shear is operated being located below the bed. Cutting speed is 60 strokes per min., while the feed is arranged for a speed of up to 200 per min. The number of cuts that can be made per minute is, of course, determined by the length of the feed.

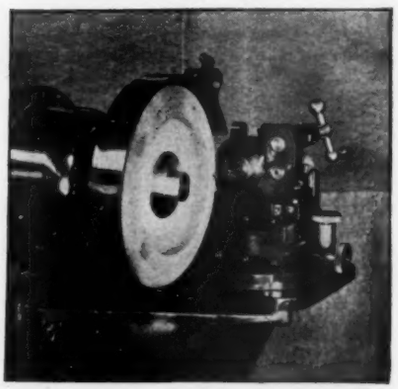
Electrical control consists of a single pushbutton panel incorporating selectors for hand, semi-automatic and automatic operation. The panel also includes an "inch" button so that the feed may be inched either forward or backward at any time. The stacker unit, or run-out table, is adjustable to accommodate sheets 24-78 in. in width, and for a feed of 6-120 in. The length of feed can be increased by extending the stacker guides on which the timer is mounted.

The heavy-duty uncoiler is of the cradle type, and is designed so that as the coil decreases in size all rollers continue to bear on the outside of the coil. These rollers are covered to prevent marring or scratching the material. The uncoiler unit is interconnected electrically with the shear so that it runs in synchronism with the feed mechanism. A limit switch, located directly behind the uncoiler, prevents this unit from overtraveling.



## Attachment Grinds Two-Diameter Drills

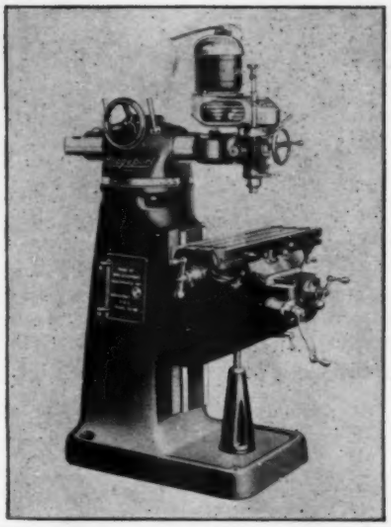
Shown mounted on a "Yankee" twist drill grinder, the dual drill grinding attachment developed by Covel Mfg. Co., Benton Harbor, Mich., will grind dual diameter drills, center drills and counter bores. The drill is inserted in the spindle of the attachment after the grinding wheel has been dressed to the proper shape and size, and the drill is positioned by an indicating finger, then the attachment is turned



by hand. The cam that regulates the clearance and throw of the drill is geared to the main spindle. Base of the attachment is circular and can be revolved so that any desired angle can be dressed on the grinding wheel. Three-lip and four-lip drills can be ground by changing the geared relation between the camshaft and the main spindle. This attachment can be used on grinding units using a 10-in. diameter cup wheel. Attachment will take drills up to 1⅜ in. in diameter and weighs 80 lb.

## Turret Miller Permits Angular Settings

Having a 15-in. diameter turret and a 5-in. diameter overarm, the turret milling machine developed by Bridgeport Machines, Inc., formerly the Bridgeport Pattern and Model Works, 52 Reamer St., Bridgeport, Conn., is

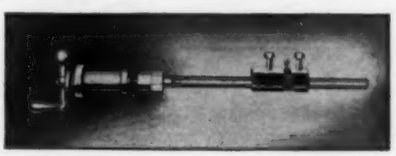


designed to permit setting the milling spindle at any angle over a large area. Provision has been made for mounting a slotting attachment on the opposite end of the arm. The master milling unit, mounted on one end of the overarm, has a quill travel of 3½ in. and provides spindle speeds of 275, 425, 700, 1050, 2100, and 4,250 r.p.m. Rack and worm feed is provided for drilling and boring with the adjustable spindle. A ½ hp. heavy-duty motor is mounted directly on the milling head.

Table, knee and saddle locks are located at the front of the machine for convenient operation. Knee is adjustable vertically to provide a maximum distance from spindle to table of 17 in. Longitudinal table feed is 20 in., while the cross feed is 9 in. maximum distance from spindle to column is 19½ in. Table measures 9 x 32. Net weight of complete machine, 1,500 lb.

## Cross Feed Screws Now Specially Hardened

The cross feed screws of all lathes made by the American Tools Works Co., Cincinnati, Ohio, now are hardened by a process which eliminates distortion and is claimed to produce a surface hardness practically impervious to wear. In order to further stabilize the cross feeding mechanism, a heat-treated bronze two-piece feed nut is employed. This nut is provided with means for compensating for wear. This is claimed to provide a constantly maintained snug fit between the screw and the nut.



## Improved Grinder Has Automatic Wheel Feed

An improved Type SG-1 Production Surface Grinder, having increased capacity, has been announced by Bergram Mechanical Engineering Co., New Britain, Conn. Similar in design to the previously announced Type SG-1 Grinder (*AM*—Vol. 82, page 34), this machine features two individually motor-driven vertical grinding spindles and a variable-speed motor drive for the rotary table. Automatic, hand or pushbutton control can be used for feeding the grinding wheels. These wheels can be from 8 to 12 in. in diameter, and the work table, which is arranged for wet grinding, is 38 in. in diameter.

In operation, the table revolves continuously, since the fixtures automatically open for ejecting the work and reloading during part of the table rotation cycle. Diamonds for dressing the wheels are adjustably mounted on the table to maintain uniform finished heights on the work. These machines can be arranged to accommodate work of any required height. For facility in setting up or changing over from one job to another, a complete assembly of fixtures, similar to those shown in Fig. 2, can be permanently mounted on a ring, so that the group of fixtures can be bolted to the table as an interchangeable unit.

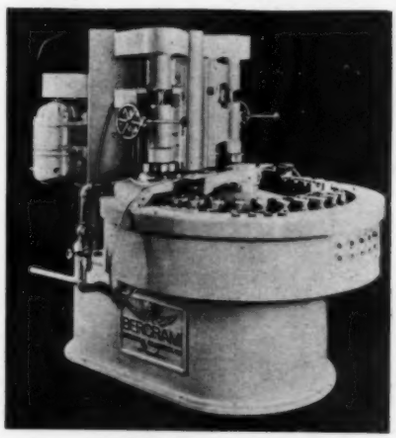



*Fig. 1—Small parts can be surface ground automatically in this improved Bergram two-spindle machine*

Usually, a roughing wheel is mounted on the first spindle, while the second spindle carries a finishing wheel. In case it is necessary to remove an excessive amount of stock, both spindles can be used for rough grinding. Welded steel construction is used for the spindle column and for the base. The fabricated structure has internal ribbing and the units are stress relieved after welding.

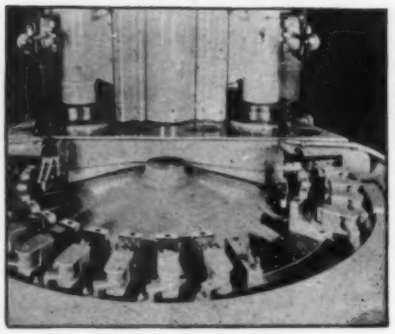
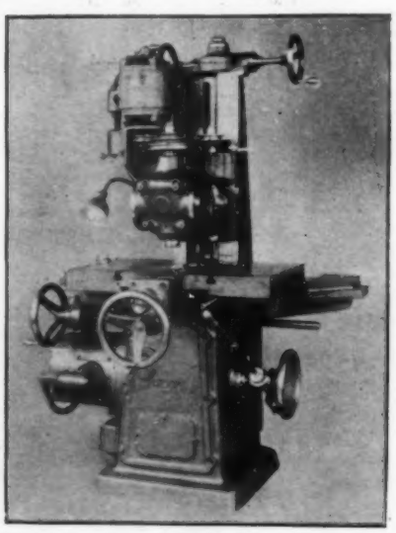


*Fig. 2—A complete set of fixtures can be permanently mounted on an interchangeable ring*

## "Multi-Versal" Machine Has Many Features

An improved "Multi-Versal" toolroom machine has been developed by the Hack Machine Co., 440 N. Oakley Blvd., Chicago, Ill. This machine is equipped with a vertical reciprocating rear ram, fitted with a master head, to which standard or special attachments and adapters are easily fitted. The base carries a 2 hp. motor and worm gear drive connected to transmit adjustable vertical reciprocating motion to the ram, which has a guaranteed accuracy of 0.001 in. in 18 in. with relation to the machine proper. When not required for reciprocating cutting, the ram may be locked in a stationary position.

The master head is a self-contained



combined horizontal lathe and milling machine spindle unit receiving its power by V-belt from a 1-hp. motor adjustably attached to the head. Six milling speeds are provided. This master head can be elevated on the ram either by hand or power feed. Height of the master head spindle above the table is adjustable from 6 to 20 in. The compound table measures 18 in. wide and 30 in. long. Micrometer dials and vernier scales are provided for all table movements. The table has longitudinal power feed operated by a ½-hp. motor.

The vertical head receives its power from the master head and can be revolved 360 deg. around the master spindle. An auxiliary vertical head, furnished as extra equipment, can be fitted to a side opening in the vertical head and can be rotated through 360 deg. at right angles to the vertical head. Either of these heads will pull a 3-in. cutter through cast iron with a ¼-in. deep cut.

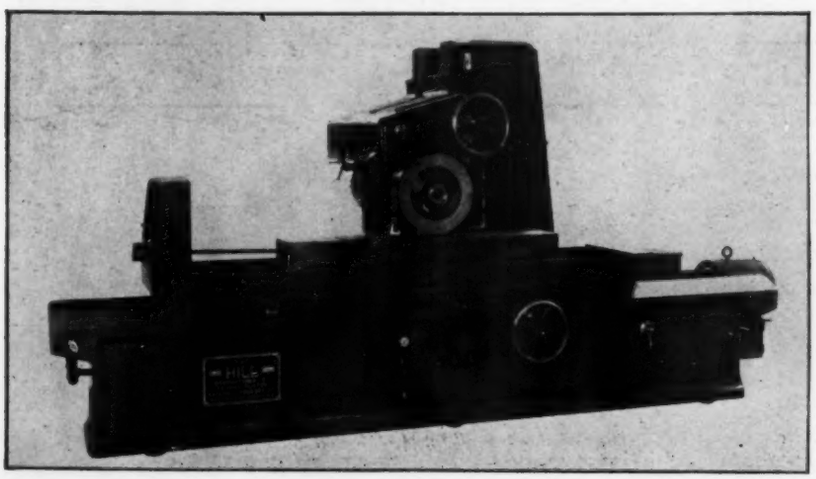
Heavy-duty files and slotting tools are secured to the master head with an adapter, and are used with the ram reciprocating vertically. A combination high-speed filer and slotter is driven from the vertical head, or can be attached to the master head by means of an adapter. It has six speeds when back geared. This attachment also can be mounted at the side opening in the vertical head. In this position it has four speeds.

The combination grinder, regularly furnished with the machine, has two quilled spindles, one arranged to take a cup-wheel, and the other arranged for small bore internal grinding. A removable hacksaw frame slips into place on the right-hand side of the master head and usually is used in connection with the elevated table, which is slotted to permit the blade to enter the work. This frame receives its motion from the rear arm and has a stroke adjustable from ½ to 3½ in. at 80 and 160 strokes per min.

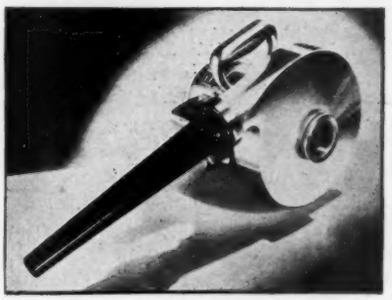
Specifications: keyway capacity, 2 in.; drilling capacity, 1½ in.; end mill capacity with vertical head, 4 in.; face mill capacity with master head, 8 in.; cup wheel grinding capacity with vertical head, 6 in.; jig saw capacity, 3 in. in tool steel; diameter of lathe face plate, 10 in.; maximum swing of lathe, 18 in.; table travel from front to rear, 10 in.; table travel from left to right, 18 in.; height of table above floor, 36½ in.; overhang of attachments, 12 in.; vertical ram stroke, ½ to 3½ in.; size of sub table, 12 in. diameter and 3 in. high; height of elevated table above standard table, 8 in.; vertical spindle speeds, 80-2,500 r.p.m.; horizontal spindle speeds, 80-300 r.p.m.; milling feeds, longitudinal and vertical, 0.720-6.000 in. per min.; floor space required, 42 x 54 in.; total height, 72 in.; weight, 3,500 lb.

## Built-in Spindle Motor Used On Hill Hydraulic Surface Grinder

Made with the working surface of the table ranging from 18 to 24 in. wide and from 60 to 240 in. long, this hydraulic horizontal-spindle surface grinder offered by the Hill Clutch Machine & Foundry Co., 6400 Breakwater Ave., Cleveland, Ohio, is arranged so that the operator conveniently can control the machine without leaving his work station. Table and cross-feed are fully hydraulic; the pump and valves being arranged in a self-contained unit for accessibility.



Wheel spindle is driven by a dynamically balanced built-in 15-40 hp. motor mounted on the end of the spindle. Rapid traverse is provided for raising and lowering the wheel-head and hand control is available for final adjustment. Forced feed lubrication is provided for the tableways and spindle bearings. Standard grinding wheels up to 6 in. wide can be used. The cross feed can be oscillated at a constant feed, or adjustable from ⅛ to 2 in. at each reversal of the table for a jump feed. Table speed is variable up to 100 ft. per min. Five motors are incorporated in this machine.



## All-Purpose Blower Provides Two Speeds

The "Cadillac" all-purpose blower offered by the Clements Mfg. Co., 6650 S. Narragansett Ave., Clearing Station, Chicago, Ill., is fitted with a universal motor for a.c. and d.c. operation. When operating at high speed, the 120 volt blower provides an air velocity of 26,000 lineal ft. per min. at a static pressure of 48 in. of water and a capacity of 176½ cu.ft. per min. At low speeds, the velocity is 20.500 lineal ft. per min., capacity is 125 cu.ft. per min. and static pressure is 36 in. of water. Speed is changed merely by operating a small, conveniently positioned switch. This tool also can be used as a suction cleaner and as a sprayer.

## Automatic Drilling Unit Uses Nine ½-Hp. Heads

The Bradford Machine Tool Co., 657 Evans St., Cincinnati, Ohio, has designed and built the automatic drilling unit shown for drilling closely spaced small holes, such as the "smoke" holes in automotive pistons at high speed. The pistons for which this machine originally was developed have 18 holes so spaced that it is impossible to drill all of them simultaneously, therefore the machine is arranged to drill nine

# THREAD GRINDING OFFERS YOU NEW SAVINGS

● To obtain the required accuracy and finish on stressed threaded parts, an aircraft engine manufacturer is using seven Ex-Cell-O Precision Thread Grinders as shown at the right. Not only are parts formerly thread milled now thread ground after hardening at comparable cost and output, but service failures have actually been reduced.

## SERVICE FAILURES REDUCED BY PRECISION THREAD GRINDING

● Production savings ranging up to about 50% on chuck collet hoods with internal threads and 75% on worms with external threads, have been made on miscellaneous lathe parts by a machine tool builder with the Ex-Cell-O Universal Precision Thread Grinder at the right. Grinding after hardening also eliminates errors caused by distortion.

## AS MUCH AS 75% SAVED BY THREAD GRINDING LATHE PARTS

● All threaded parts are now ground from the solid, after hardening, by a manufacturer of airplane landing gear struts. With the Ex-Cell-O Universal Precision Thread Grinders at the right, machining time has been reduced 50%, rejections are almost eliminated, assembly is faster and a stronger fit is secured between mating parts.

● If you are interested in saving money with Ex-Cell-O Precision Thread Grinders, write today for complete information.

Catalog No. 681.

## MACHINING AND ASSEMBLY TIME CUT—PRODUCT IMPROVED

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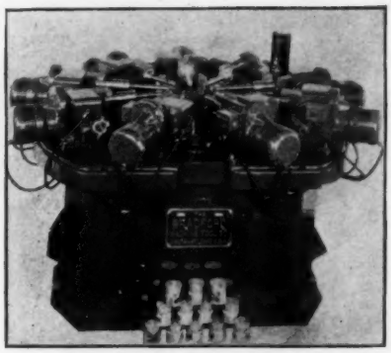
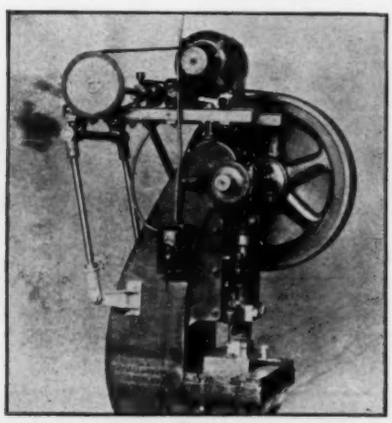


holes, automatically index the piston 180 deg., and then drill the remaining nine holes.

The machine consists of a welded steel base which supports a cast iron table on which nine No. 0 automatic ½ hp. motor-driven drill units are fastened. This method of mounting permits future changes in the event that drill locations are changed. The pot-type holding fixture is placed on an electrically-operated index table which is actuated and controlled entirely by solenoid and limit switches. Synchronization of all movements is assured by electrical interlocks to prevent interference between various functions of the machine. Spindle speeds are 5,100 r.p.m. and indexing time for the 180 deg. index is less than ½ sec.

## "Remco" Press Drive Is Fully Adjustable

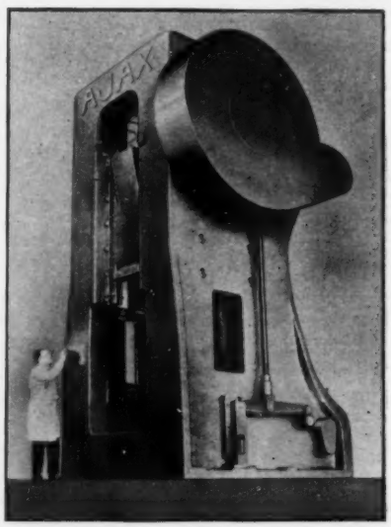
Three sizes of the punch press drive developed by the Remco Products Corp., York, Pa., are available to fit a wide range of punch presses. The main rails of the drive hold the motor and countershaft bearing. These rails are adjustable to permit the use of new or old motors of reasonable size and speed without boring any holes. Both the countershaft and the motor base are adjustable to provide proper tension on the belt. Since the drive embodies two reductions of speed from the motor to the flywheel, the use of 1,750 r.p.m. motors is practical.



## Huge Forging Presses Have 2,000-Ton Capacity

Forging presses of 2,000-ton capacity, built by The Ajax Mfg. Co., 3830 Lakeside Ave., Cleveland, Ohio, have recently been placed in operation in the forge plants of two of the large automobile companies in the Detroit area. They are being used for forging rear axle ring gears and a variety of smaller forgings in multiples from pre-rolled blanks.

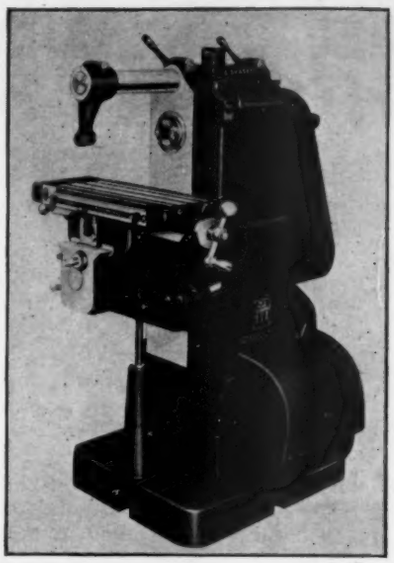
Each complete press weighs 260,000 lb. The frame is an integral, one-piece steel casting weighing 100 tons.




On classes of work where moderate operating speeds are desirable, presses of this tonnage are built with two-stage reduction gearings. Where higher speeds are required, in excess of 50 strokes per minute, single-stage gearing is used.

## No. 0 Plain Miller Offered for Job-Lots

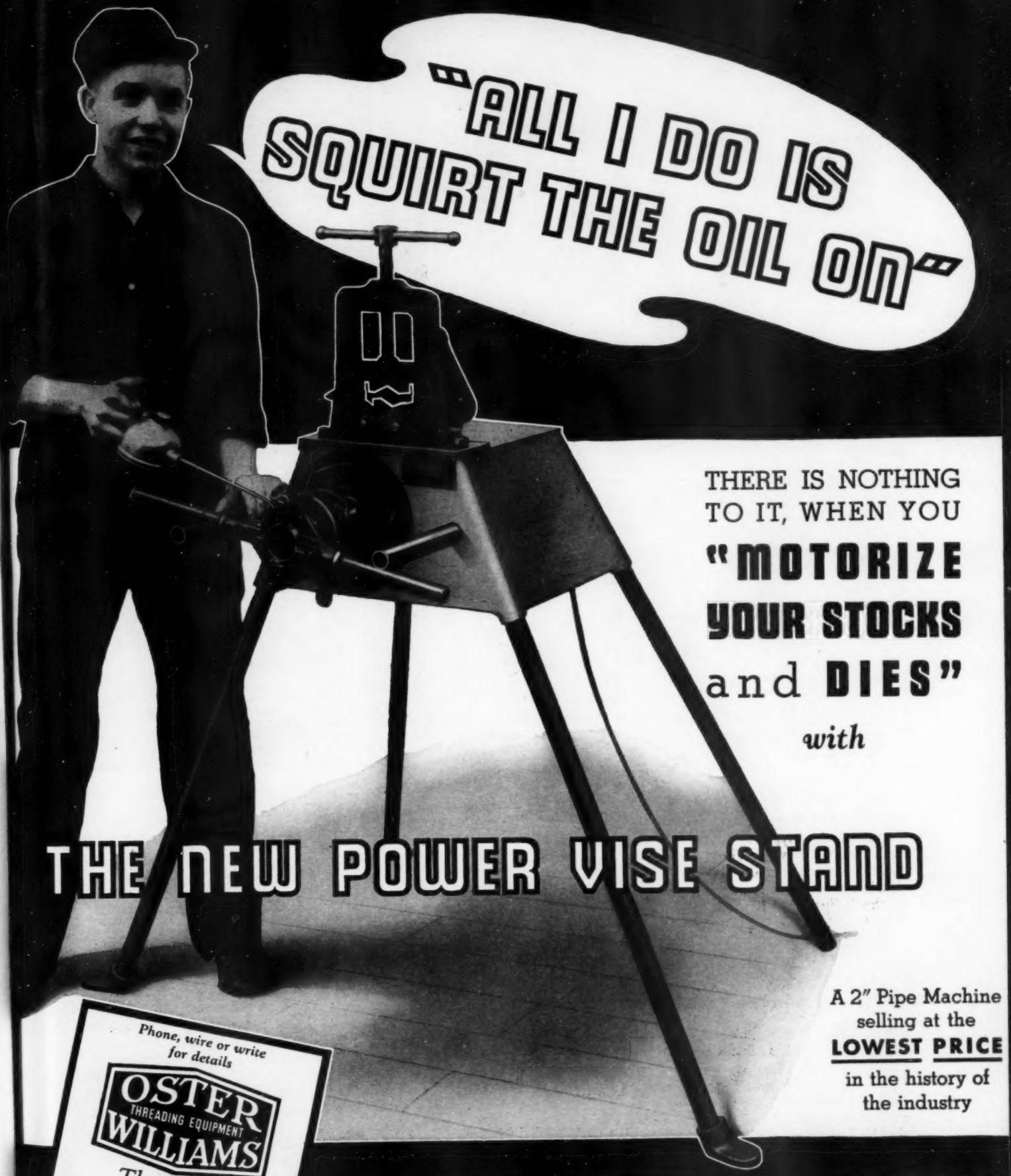
Suitable for use where medium-light cuts are required for job-lot or small-quantity production, the No. 0 plain milling machine offered by Brown & Sharpe Mfg. Co., Providence, R. I., is similar in design to the No. OY plain miller, but does not have the semi-automatic table. While arranged for motor drive, it also can be furnished for overhead countershaft drive. There are eight changes of spindle speeds, in two series, in approximately a geometrical progression from 120 to 1,350 r.p.m. On the motor driven machine, changes are obtained through four-step cone pulleys and change gears. A 1 hp. motor is used.



There are eight changes of feed rate for each spindle speed, varying in approximately a geometrical progression. The 64 rates of speed available range from $\frac{5}{16}$ to 79$\frac{3}{8}$ in. per min. Table has 18 in. of automatic longitudinal feed, 6 in. transverse adjustment by hand, and a hand-operated vertical knee adjustment of 14 in. Including oil pans and channels, the table measures 29¼ x 8$\frac{13}{16}$ in., and it has a 22½ by 8$\frac{13}{16}$ in. working surface. Standard equipment includes a flanged vise, coolant drip cam, draw-in bolt, screws for attaching adapters to the spindle end, and a set of wrenches. Floor space required is 52 x 60 in. Net weight of machine fitted with drive motor is 1,630 lb.

## "Murco" Unit Heater Made in 25 Models

D. J. Murray Mfg. Co., Wausau, Wis., is offering 25 models of the "Murco" unit heater with capacities

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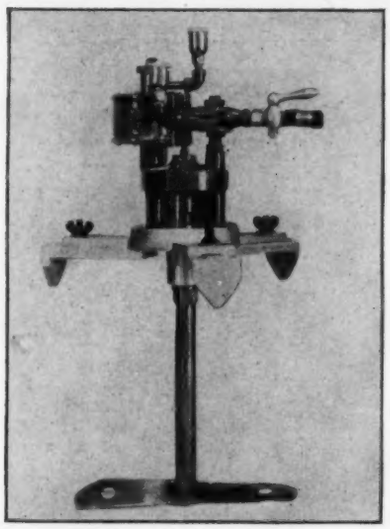
ranging from 20,600 to 556,000 B.t.u. per hr. and to deliver 430 to 8,600 cu. ft. per min. The heating elements are copper tubes that are expanded into high-test alloy cast iron headers so that no strains are set up. The condenser is attached to the casing by a spring support so that the condenser is full floating to overcome

## "Pneumix" Agitator Handles Heavy Materials

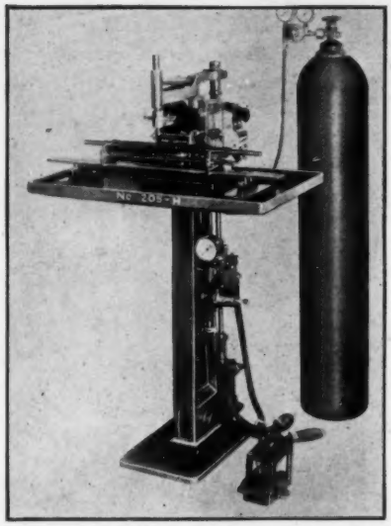
The air motor used on the "Pneumix" Type D agitator drives through gears having a ratio of 40 to 1 for handling heavy materials. The motor and gear assembly is detachably mounted on a spider-type platform, adjustable to diameters of from 12 to 26 in. to fit anything from a 5 gal. can to a 55



gal. drum. The standard shaft is from 12 to 27 in. long. Propellers are supplied in two types; either 8 in. six-bladed turbo type, or 10 in. two-bladed airplane type. They can be made of bronze, stainless steel or nickel. This agitator is manufactured by the Eclipse Air Brush Co., 390 Park Ave., Newark, N. J.

## Electric Spot Welder Uses Hydrogen Gas

An electric spot welder equipped with an automatic hydrogen gas economizer has been developed by Eisler Engineering Co., Inc., 745 S. 13th St., Newark, N. J., for welding molybdenum, nickel and similar metals. Hydrogen gas is introduced at the time of welding to prevent oxidation, discoloration, corrosion, and brittleness. The flow of hydrogen is directed at the spot where the welding takes place. The automatic



gas economizer and shut-off valve are so arranged that immediately after the weld is completed the gas is cut out. The machine shown is of the pneumatically-operated vertical plunger type and has a capacity of 5 kva. Similar machines are made in sizes up to 250 kva.

## "Preselector" Sets Hydraulic Gearshift

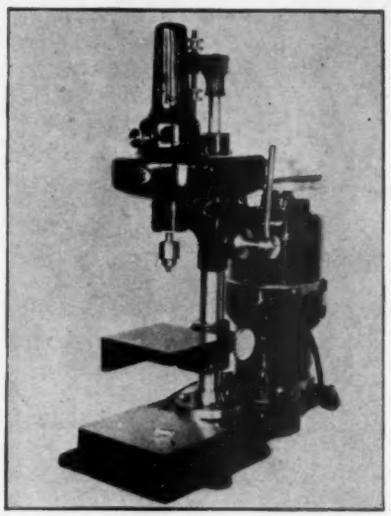
Bardons & Oliver, Inc., 1133 W. Ninth St., N.W., Cleveland, Ohio, now are offering the No. 5 and No. 7 universal turret lathes equipped with a single lever spindle speed "preselector" which permits considerable reduction in machine operation time. The spindle speeds may be preselected at any time and shifted almost instantaneously, when desired, by the single control lever. Spindle speeds are indicated on a dial placed in conjunction with a chart indicating the cutting speeds for corresponding diameters of work.

In actual application, the preselective control permits the operator to turn the selector dial to the second speed required for a particular operation while the machine is running at the first speed. When the work at

the first speed is completed, a simple movement of the control lever opens the clutch, shifts the gears hydraulically and reconnects the drive to the spindle, now ready for machining operations at the new speed. Removable clips on the dial of the preselector carry numerals indicating the number and sequence of speeds desired for a combination of operations.

## Model R-53 Drill Has Four Speeds

A four-speed Model R-53 precision bench drill having capaciity from No. 80 to $\frac{1}{4}$ in. has been announced by the High Speed Hammer Co., Inc., 305–321 Norton St., Rochester, N. Y. Drilling speeds are 750, 1,500, 3,000 and 6,000 r.p.m. It is claimed



that holes 0.010 in. in diameter have been drilled successfully with this machine.

## Hydraulic Feed Used In Metal Bandsaw

The improved Type JM-20 in. metal-cutting bandsaw announced by William Laidlaw, Inc., Belmont, N. Y., incorporates a low-pressure hydraulic feed with an adjustable tappet which can be used to stop the feed after it has traveled a predetermined distance. The unit shown has a capacity of 8 x 10 in., with a 20-in. throat depth. It can be equipped with ball bearing roller saw guides for blades ranging from $\frac{1}{4}$ to $\frac{5}{8}$ in. wide. The guides are mounted on the table and swing with it to assure alignment at all times without adjustment, regardless of the position of the carriage. The vise jaws are graduated for cutting angles up to 90 deg. The machine has eight

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# LEBLOND HEAVY DUTY SLIDING BED GAP LATHES

*No. 2 of a series of pen portraits presenting the tools that serve production progress.*

## A RUGGED HEAVY DUTY PRECISION LATHE OF WIDE RANGE VERSATILITY AND REAL ECONOMY

If the work in your plant is irregular in size or shape, or with projecting parts, or requires varying center distances and greater clearance . . . the LeBlond Sliding Bed Gap Lathe is the perfect answer to your problem.

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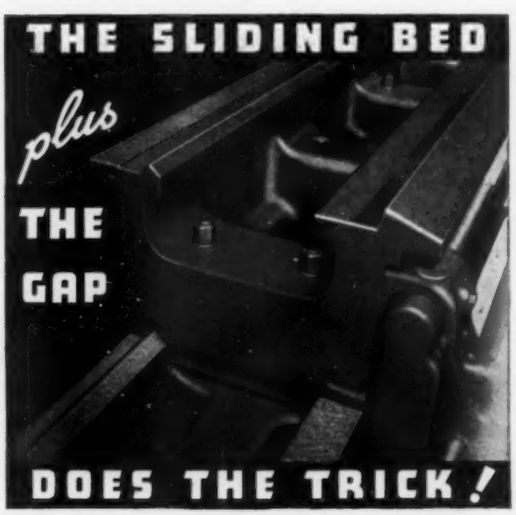
This sliding bed feature serves a dual purpose. It widens the gap to provide essential clearance for irregular or projecting parts, and increases the length which may be taken between centers.

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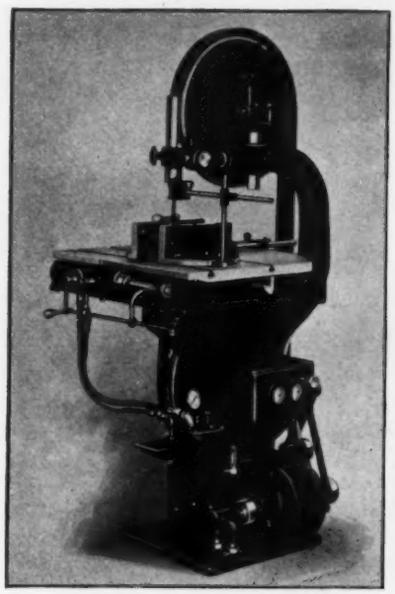
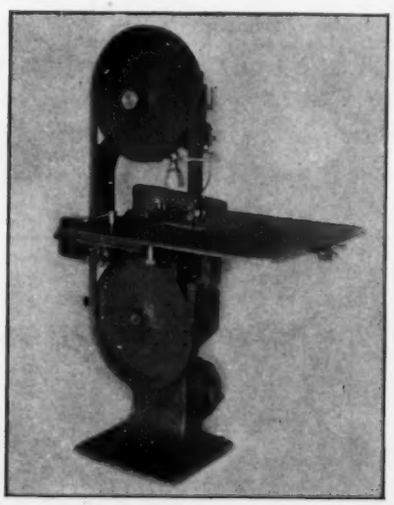


speed changes ranging from 50 to 365, or from 100 to 725 ft. per min. of saw travel. Speeds up to 2,600 ft. per min. can be provided to suit special requirements.

## Type JMR-20 Bandsaw Provides Eight Speeds

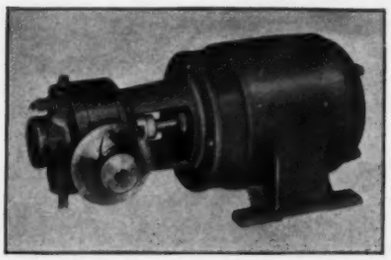
Suitable for cutting accurately radials from 1½ to 9 in. in diameter, the Type JMR-20 bandsaw announced by William Laidlaw, Inc., Belmont, N. Y., is powered by a 1-hp., 1,750 r.p.m. motor. Two speed ranges are avail-



able from 50 to 365, or from 100 to 725 ft. per min. of saw travel. The machine is equipped with ball bearing roller saw guides for ¼ and ⅜ in. saw blades. Clearance of 2½ in. is provided under the guide arm of the radial control screw.

## Variable-Volume Pump Has Accurate Control

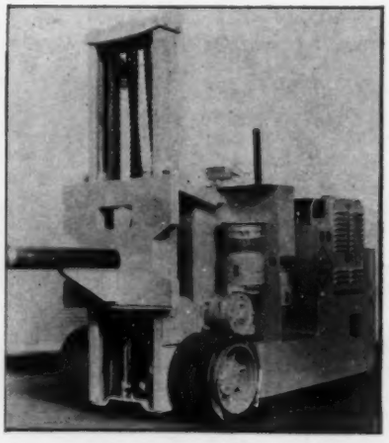
Combining the three-piston cylinder body and rotary valves on a single shaft, this variable volume hydraulic pump announced by the Denison Engineering Co., 236 Water St., Colum-



bus, Ohio, is claimed to provide accuracy of control to a minimum of 5 cu. in. per min. Among the features incorporated in this pump is a quick pick-up which will allow the pump to deliver its maximum volume when it is not working against the load. The unit is recommended for continuous operation at 1,000 lb. per sq. in. pressure, and for intermittent operation at 2,000 lb. per sq. in. Two sizes are built, with 100 and 175 cu. in. per min. capacities.

## Ram Truck Features Centralized Control

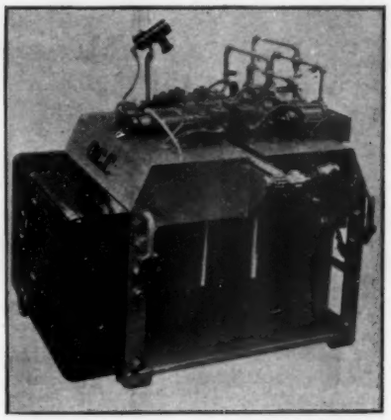
Travel, lift and tilt motion of the Type F-5 center drive ram or fork truck developed by Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland, Ohio, are controlled through a centralized contactor control system. These trucks have rated capacities up to 14,000 lb. The power plant is equipped with a 500 per cent overload, heavy-duty and high-torque motor. Trail axle is of a compensating rocker type cushioned on rubber.



Wheels are mounted on and swivel in anti-friction bearings. Truck may be equipped with wheel or power steer.

## Type LS Forging Heater Has Chain Conveyor

The No. 5 Type LS forging heater shown was developed by the American Car and Foundry Co., 30 Church St., New York, N. Y., for heating 2 in. on both ends of a 1-in. round bar, giving two heats every 7 to 8 sec. The stock is fed by hand and,



after the jaws are released by the photo-electric cell control, is dropped on the moving chain conveyor and brought out to the front of the heater where the operator is feeding an upsetting machine. The electrodes open and close by pneumatic cylinders.

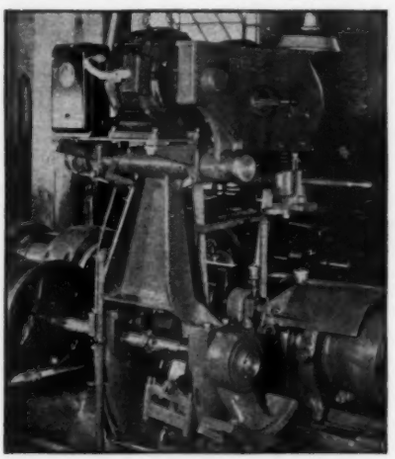
## Right-Angle Heads For Portable Tools

A line of air-driven right-angle drills, screwdrivers and nut setters, in a range of sizes for drilling ¼ to $\frac{9}{16}$ in. holes, for nut setting from ¼ to ⅝ in., and for screw driving from No. 8 wood screws to ½ in. machine screws, has been announced by the Rotor Tool Co., 17325 Euclid Ave., Cleveland, Ohio. The angle head casings are made of malleable iron and are bolted directly to the gear case. They are equipped with ball bearings to take the thrust and with two roller-type bearings for the pinion and spin-

dle gear. Three types of clutches are available for nut setting and screw driving. Both short and long heads are available, together with a large variety of spindles.

## Cullman Machine Drive Has Three Speeds

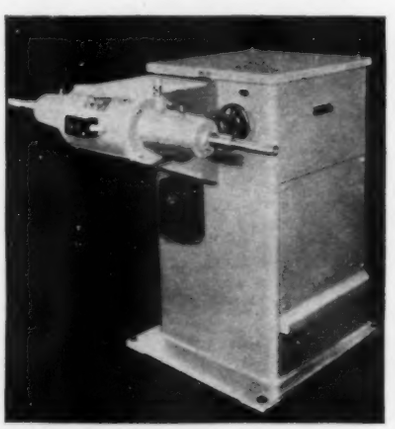
Developed especially for driving Cleveland automatic screw machines, this machine drive offered by Cullman Wheel Co., 1344 Altgeld St., Chicago, Ill., is equipped with a gear case which provides three speed changes. These drives are made for machines of $\frac{7}{8}$ to 6 in. capacity with motors ranging from 2 to 15 hp. The



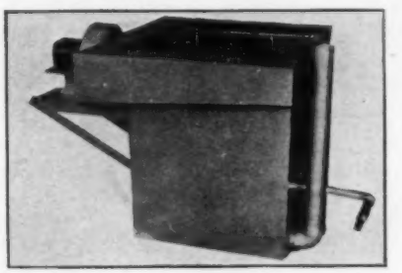
speed reducer used separately for driving the feed mechanism is provided with a flywheel to aid in applying extra pressure on the collets when clamping the stock.

## Polishing Lathe Has 14-In. Overhang

Designed to provide freedom in handling large and bulky pieces, this variable speed polishing and buffing



lathe offered by Crown Rheostat & Supply Co., 1910 W. Maypole Ave., Chicago, Ill., provides speeds ranging from 870 to 3,050 r.p.m. merely by turning the control handwheel. Overhang is 14 in. The standard unit operates from a V-belt drive connected to a 5 hp. motor.

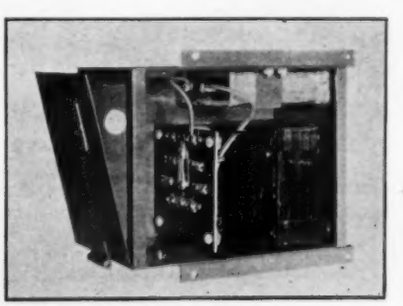


## Chrome Plating Tank Is Gas Heated

A chrome plating tank having a self-contained gas heating arrangement has been designed and built by Heil & Co., 3088 W. 106th St., Cleveland, Ohio. This lead-lined tank is furnished complete with an exhaust arrangement and gas heater for operation without accessory equipment. The design incorporates an immersed gas flue system arranged so as not to expose the heating flues to the corroding effect of chromic acid.

## Multi-Step Controller Designed for A.C. Motors

The Raytheon Mfg. Co., 157 Willow St., Waltham, Mass., has developed a multi-step speed controller for a.c. motors which makes it possible to vary the motor speed by changing the input voltage. This



method is claimed to permit the motor being operated by a thermostat or automatic switch, since it insures that the motor will always restart, regardless of the controller setting. Voltage control can be by means of a movable link, as shown, or by an inclosed multi-position tap.

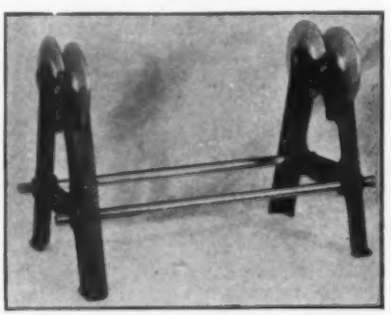
## "TuType" Wrenches Made in 13 Sizes

Drop forged of chrome-vanadium steel in thirteen sizes, the "Zenel

TuType" wrenches offered by Bonney Forge & Tool Works, Allentown, Pa., have openings ranging from $\frac{3}{8}$ to $1\frac{7}{16}$ in. Combining an open-end and box wrench, each with the same size opening in a single tool, these wrenches permit the use of the end most applicable to the job at hand.

## Rotor Balancing Ways Are Self-Contained

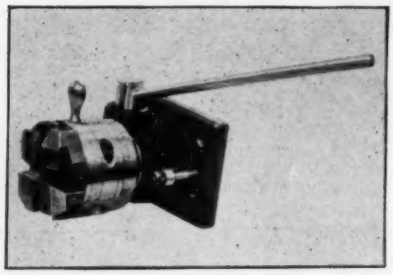
No leveling or setting-up is required when using the static balancing ways introduced by the Ideal Commutator Dresser Co., 1057 Park Ave., Sycamore, Ill. Free turning semi-steel



disks mounted on precision ball bearings carry the armature to be balanced. Three standard units are available in the following capacities: 300 lb. capacity with 10 in. swing; 1,000 lb. capacity with 20 in. swing and 1,000 lb. capacity with 42 in. swing.

## Hand Feed Adapter Offered for Die Heads

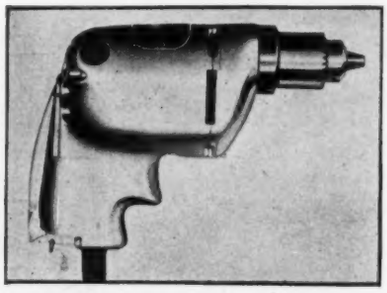
An improved sliding adapter for mounting Landmatic die heads on heavy-duty turret lathes is offered by the Landis Machine Co., Waynesboro, Pa. This adapter not only permits a floating action for the die head, but also provides a gear mechanism for starting the die head onto the work by hand. With this adapter, the forward or thread-starting movement of the die head is accomplished through an intermediate gear mech-



anism contained within the unit. The die head automatically is opened by a lug which extends through a longitudinal slot in the adapter housing.

## Light-Weight Drill Has 3/16-In. Capacity

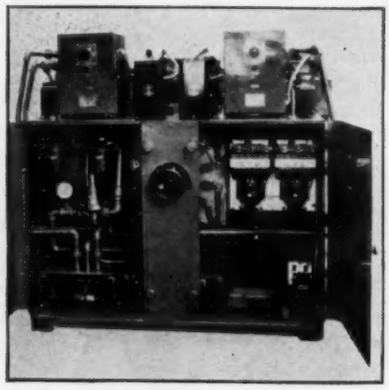
Weighing only 34 oz., the "Hornet" portable electric drill offered by the Black & Decker Mfg. Co., Towson, Md., has capacity for drilling $\frac{3}{16}$-in. holes in steel. It is designed for con-



tinuous production service and is particularly applicable for aircraft and light industrial work. This tool incorporates a splined gear mounting, ball bearings, screened air inlets, fan, grip-type switch, and a universal motor. Operating speeds are 3,700 or 5,200 r.p.m. as desired.

## Special Berwick Heater Developed for Treadles

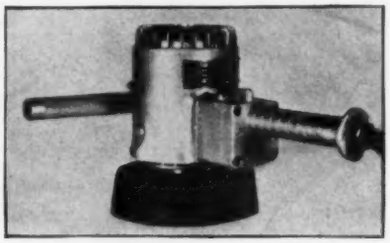
American Car & Foundry Co., 30 Church St., New York, N. Y., designed and built the No. 5 Berwick two-electrode special electric heater



for making the foot-treadles on a line of 1939 automobiles. These are made from $1\frac{1}{2}$ x $\frac{3}{8}$ in. flat stock. After the stock is heated in this machine it is put under a drop hammer, the bend is made and the rest of the upset of the upper foot portion is completed. Two photo-electric cells, located in the two large boxes on the top of the frame, control the temperature to which the pieces are heated.

## "Gaston" Disk Grinder Operates at 3,400 R.P.M.

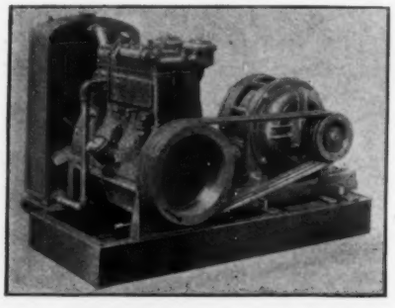
The 2-hp. motor in this portable disk grinder, offered by Gaston Power



Tools, 2657 W. 95th St., Evergreen Park, Chicago, Ill., operates the 7-in. disk grinding wheel at a speed of 3,400 r.p.m. This unit has only two bearings and no gears. It is designed to operate from a 230-volt, 3-phase, 60-cycle power circuit. Weight is 15 lb.

## "Utility" Compressors Have Improved Cooler

An improved cooling unit has been developed for the "Utility" stationary air compressors manufactured by Schramm, Inc., West Chester, Pa. The radiator fan of this unit is



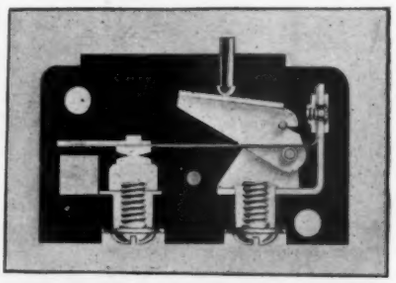
mounted on the compressor crankshaft and the self-contained cooling unit, which operates on a thermo syphon principle, provides a constant method of cooling. These compressors are made in four and six cylinder models and deliver 76 to 423 cu. ft. of air at the rated motor speed when using an a.c. motor.

## "Billings" Bench Cutter Made For Round Stock

Claimed to cleanly cut off drill rod and wire up to $\frac{1}{4}$ in. in diameter without leaving a burr, the round stock cut-off tool offered by the Billings & Spencer Co., Hartford, Conn., can be secured to a work bench for permanent installations, or set up in a vise. This tool is drop forged, machined and heat-treated for long service. The bar is $15\frac{3}{4}$ in. long.

## Compact Snap Switch Has Shore Travel

Available in a number of types, this compact, low-operating pressure, short-travel type snap switch developed by McDonnell & Miller Co.,



Wrigley Bldg., Chicago, Ill., accomplishes a quick make or break with a wide air gap while still retaining the advantages of highly sensitive, short-movement operation. The switch measures only $1\frac{7}{8}$ x $1\frac{5}{32}$ x $\frac{11}{16}$ in. It will operate on both a.c. and d.c. circuits. The operating force required to open or close the switch is as low as 3 oz., but types are available with operating pressures up to $12\frac{1}{2}$ oz. Plunger movement may be as short as 0.005 in. or as long as 0.014 in.

## Graphite Solution Lubricates Chains

Conveyor chains operating in high temperature zones, such as in baking and enameling ovens, can be lubricated effectively with a solution of kerosene and finely divided colloidal graphite developed by Acheson Colloids Corp., Port Huron, Mich. The colloidal graphite is suspended in the volatile kerosene which evaporates, leaving a very thin deposit of fine colloidal graphite on the surface of the conveyor chain. It is claimed that this film of graphite, although extremely thin, provides lasting lubrication for difficult-to-reach friction surfaces under high operating temperatures.

## New Molding Materials Are Asbestos Filled

Two asbestos-filled "Durez" molding materials have been made available commercially by General Plastics, Inc., Walck Road, North Tonawanda, N. Y. Durez No. 38–443, was formulated specifically to meet Underwriters' specifications to withstanding 200 C. for 72 hr. It has an impact strength of 0.23 (ASTM) and a compressive strength of 28,000 (ASTM). Heat resistance is recorded at 490 F. and specific gravity is 1.80. Durez No. 38–646 has a low specific gravity of 1.59 and a slightly higher heat-resistance, 500 F., but a lower impact strength—0.19 (ASTM).

## Current Transformer Rated at 600 Volts

Developed especially for metering low voltage circuits, the Type JL-1 indoor current transformer offered by General Electric Co., Schenectady, N. Y., is rated at 600 volts and is available in current ratings of 200/5, 400/5 and 600/5 amp. Primary windings are of sufficient size to permit continuous operation at 150 per cent of rated primary current. Primary terminal surfaces are silver-plated and the secondary terminals are of the solderless type, being operated easily with a screw driver.

## "Titeseal" Compound Is Non-Hardening

"Titeseal" gasket and joint sealing compound offered by Radiator Specialty Co., Charlotte, N. C., is claimed to be flexible and non-hardening. It seals against water, steam, gas, oil, grease and anti-freeze leaks and may be used with gaskets, or as a gasket where joint tolerance permits. It is claimed to be unaffected by heat, cold, or extreme fluctuations in temperature and is said to prevent rust.

## New Process Aids in Finishing Zinc Surfaces

By dipping zinc or zinc-coated products in a solution of a compound called "Zinsol" developed by Maas & Waldstein Co., 438 Riverside Ave., Newark, N. J., an alloy of zinc and another metal is caused to form on the surface. This alloy is chemically inert to moisture and organic finishes generally so that it forms a stable foundation for any desired kind of finish. Heretofore it has been difficult to secure durable, strongly adhering clear or colored coatings of organic finishes on zinc unless the finish used was selected with great care, since the oxidation products of zinc combine chemically with the constituents of most finishes and, hence, destroy them. Lacquers, enamels, paints or varnishes can be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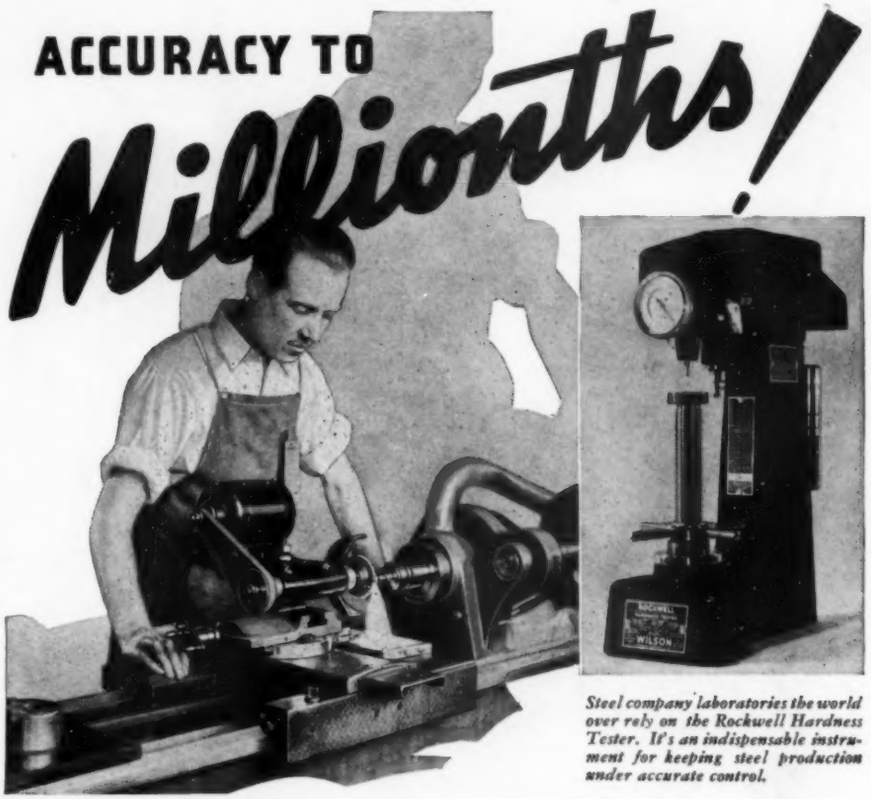

*Steel company laboratories the world over rely on the Rockwell Hardness Tester. It's an indispensable instrument for keeping steel production under accurate control.*

**Accuracy is religion at the Wilson Mechanical Instrument Co., New York. It's got to be! They're the makers of the famous Rockwell Hardness Tester . . . an instrument designed to measure steel hardness by the depth system—requiring accuracy to *within 20/1,000,000 of an inch.* But such close work would be impossible without tools equally dependable for their precision. That's why Dumore is proud to have a part in the making of this instrument. There are six Dumore No. 5 Grinders now in use at the Wilson plant. As the Wilson Company will tell you, Dumore Grinders were selected for their high speed, power and precision . . . and the unfailing dependability on the production line. External, and internal grinding up to a 5-inch depth, is done to within plus or minus .00025 inch...a tough job in any man's shop. If you have a grinding problem that's got you down, do what Wilson did. Call in a Dumore distributor, no obligation. Write today for new 1939 Dumore catalog.**

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**DUMORE**

**PRECISION GRINDERS**

applied on zinc surfaces after being treated with this compound. Where the parts are large, the solution can be wiped over the surfaces.

## "Visulope" Protects Blueprints and Orders

Curtis 1000 Inc., 1000 University Ave., St. Paul, Minn., offers the "Visulope" envelope for positive and permanent protection of shop blueprints and work orders. It is made from a thermo-plastic sheet and will withstand moisture, will not become brittle with age, is oil and grease proof, will neither stretch nor shrink, and is non-inflammable.

## "Super Royal Cord" Hose Employs Synthetic Rubber

An improved "Super Royal Cord" air hose, developed for use under severe service conditions by the Mechanical Goods Div., United States Rubber Products, Inc., employs a synthetic rubber tube and a gum cover, both bonded to the hose body. The body is flexible and lighter.


A RECENT INDEPENDENT SURVEY ASKED:

*"Based on your own experience in cutting oils, which companies would you recommend?"*

RESULTS:

Houghton, 2 to 1

OVER THE SECOND CHOICE

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An all-inclusive series of straight cutting oils and bases, embodying the latest developments in sulphurized and E. P. treated products for *every* cutting need.

CUT-MAX Base No. 7, containing an 18% minimum of superactive sulphur—combined in a colloidal state—is absolutely unequalled in refrigerating and cutting efficiency. We will prove this in your plant.

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**Today Houghton still leads because of the proven ability of its cutting oils to provide finer finish, higher surface speed and longer tool life. Write for illustrated leaflets describing CUT-MAX Straight Oils and Bases, and the "60" Series of Soluble Cutting Oils.**

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## TRADE PUBLICATIONS

**ACETYLENE** A 40-page booklet entitled "Cold Weather Care of Acetylene Generating and Distributing Equipment," published by the Linde Air Products Co., 205 E. 42d St., New York, N. Y., contains suggestions for the maintenance of acetylene generators and associated equipment subject to freezing.

**BORING TOOLS** The Eclipse Counterbore Co., 7400 S. Aubin Ave., Detroit, Mich., has issued a series of new pages for its catalog describing the "Mikro-Lok" line of boring tools.

**GRINDING WHEELS** The United States Grinding Wheel Co., 182 Lafayette St., New York, N. Y., has announced publication of a 32-page catalog listing grinding wheels, abrasive grain, mounted wheels, mounted points and cut-off machines.

**HITCH FEED** Bulletin No. 88, released by the H. E. Dickerman Co., 286 Wilbraham Ave., Springfield, Mass., features a line of hitch feeds for punch press applications.

**HOIST MOTORS** Data Sheet 3530, issued by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., contains four pages of illustrations and specifications concerning Type CI wound-rotor induction motors for crane and hoist service.

**IMPACT TESTING** "Symposium on Impact Testing," published by the American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa., includes in its 170 pages the nine technical papers and discussions which comprised the symposium on impact testing held at the 1938 A.S.T.M. annual meeting. Copies are available from the society headquarters for $1.25 each.

**INDICATOR** A rugged "cushioned movement" dial indicator is described in a leaflet issued by the Federal Products Corp., 1144 Eddy St., Providence, R. I.

**SPECIAL GAGES** A leaflet now being distributed by the Federal Products Corp., 1144 Eddy St., Providence, R. I., describes a list which gives specifications of many special gages designed for use with dial indicators.

**TORSION TESTING** Comprising the Edgar Marburg lecture delivered before the 1938 meeting of the American Society for Testing Materials, "The Torsion Test," by Dr. Albert Sauveur, contains information on tests at elevated temperatures, reversed

twisting, and torsion of single crystals. Copies may be obtained from society headquarters, 260 S. Broad St., Philadelphia, Pa., for 35 cents each.

**TUBING** Knitting wire tubing suitable for many applications in the industrial field is described in a mailing folder offered by E. H. Titchener & Co., Binghamton, N. Y.

## NEW BOOKS

FORMULAS FOR STRESS AND STRAIN.—*By Raymond J. Roark, Professor of Mechanics, The University of Wisconsin. 326 pages, 6 x 9 in. Clothboard binding. Indexed and illustrated. Published by the McGraw-Hill Book Co., 330 W. 42nd St., New York, N. Y. Price, $3.*

The need for high speed machinery with weight very often kept at a minimum calls for greater accuracy in the work of the machine designer. No longer does it do to detail parts empirically with the belief that they are more than ample in size to carry the extreme stresses they will undergo in practice.

Professor Roark's volume is intended for the modern machine designer who takes the trouble to find the actual stresses to be met and the minimum size of the members which will meet them. He has compiled what is primarily a working reference book. With this in mind much of the material is given in graphical handbook style. In the interest of brevity the author does not go into the derivation of formulas, nor does he give detailed explanations. Those who seek such information are given references to more complete discussions. Included, however, are a sufficient number of examples so that the application of the various methods may be quickly understood.

•

PRACTICAL DESIGNS FOR DRILLING AND MILLING TOOLS.—*By C. W. Hinman, Kobzy Tool & Electrical Manufacturing Company, Chicago, Ill. 171 pages, 6 x 9 in. Clothboard binding. Indexed and illustrated. Published by the McGraw-Hill Book Company, 330 W. 42nd St., New York, N. Y. Price, $2.50.*

Jigs and fixtures are necessarily special. They are built for certain jobs and hence are, as a rule, designed but once, very often with little reference to previous practice. Because of the empirical nature of the subject, it has been difficult to find a book that will be of real help to the tool designer.

Mr. Hinman avoids this difficulty by describing certain principles which underlie tool designs, giving specific applications to demonstrate how these principles may be applied in practice.

His volume includes much information of general value to the tool designer. Before getting down to the detailed design of drilling and milling tools, he discusses drafting, including the handling of drawings and methods of dimensioning, shop mathematics, gaging methods and the use of hand tools.

The chapters dealing with jigs and fixtures describe the best uses for conventional designs and the recommended designs of jig elements such as fastening cams and supports. Such topics as equalizing clamps and centralization of work are stated fully.

Readers of *American Machinist* will recognize much of the material contained in this volume as it was published serially under the general heading "Practical Steps in Tool Design." This material, however, should not be confused with the current series by the same author, "Press Working of Metals."


**Here Are America's No. 1**
**GRINDERS AND BUFFERS**

Heavy Duty Pedestal Grinder

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HERE is shop equipment designed for higher production . . . refined for greater efficiency . . . built for endurance! Yet because it is made on large-scale production schedules you *pay no more* for its evident greater value!

Quality tools usually cost more. More is put into them in the way of better materials and better engineering. Consequently you get more out of them in the way of better performance.

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Buffer spindles are ball-bearing mounted in dustproof housings . . . heavy supporting sleeves insure extreme rigidity for heavy buffing and polishing of all kinds.

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## PATENTS

Printed copies of patents are furnished by the Patent Office at 10 cents each. Address the Commissioner of Patents, Washington, D. C.

### January 10, 1939

#### Metal-Working Machinery

*Lathe.* Philber A. Abe, Sidney, Ohio, assigned to the Monarch Machine Tool Co., Sidney, Ohio. Patent 2,143,255.

*Cam Making Machine.* Clifford A. Bickel, Sidney, Ohio, assigned to the Monarch Machine Tool Co., Sidney, Ohio. Patent 2,143,258.

*Die Casting Apparatus.* Torbjorn C. Korsmo, Madison, Wis., assigned to Madison-Kipp Corp., Madison, Wis. Patent 2,143,323.

*Honing Machine.* William D. Schmidt, Worcester, Mass., assigned to the Heald Machine Co., Worcester, Mass. Patent 2,143,454.

*Machine for Intrusively Punching.* Frank Jermain Chandler, Toledo, Ohio, assigned to the Perfotex Co., Toledo, Ohio. Patent 2,143,507.

*Machine Tool Control Circuit.* Walter D. Archea and Carlton E. Brown, Cincinnati, Ohio, assigned to Cincinnati Grinders, Inc., Cincinnati, Ohio. Patent 2,143,533.

*Apparatus for Making Metal Rings.* Thomas G. Monahan, Cuyahoga Falls, Ohio, assigned to the Firestone Steel Products Co., Akron, Ohio. Patent 2,143,707.

#### Parts and Mechanisms

*Chuck,* Leo Imblum, San Diego, Calif. Patent 2,143,010.

*Press With Compound Ram.* Howard F. MacMillin, Mount Gilead, Ohio, assigned to the Hydraulic Press Corp., Inc., Wilmington, Del. Patent 2,143,112.

*Thread Cutting Device for Lathes.* William Ogilvie, Knowle, England, assigned to B. S. A. Tools, Ltd., Birmingham, England. Patent 2,143,794.

#### Processes

*Method of Manufacturing Turbine Diaphragms.* Arthur R. Allard, Drexel Hill, Pa., assigned to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Patent 2,143,462.

*Method of Manufacturing Turbine Diaphragms.* Arthur R. Allard, Drexel Hill, Pa., assigned to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Patent 2,143,464.

#### Tools and Accessories

*Metal-Spraying Equipment.* Donald D. Taylor, Duncannon, Pa. Patent 2,143,232.

*Rod Bending Apparatus.* Helgo W. Jespersen, Western Springs, Ill., assigned to Western Electric Co., New York, N. Y. Patent 2,143,416.

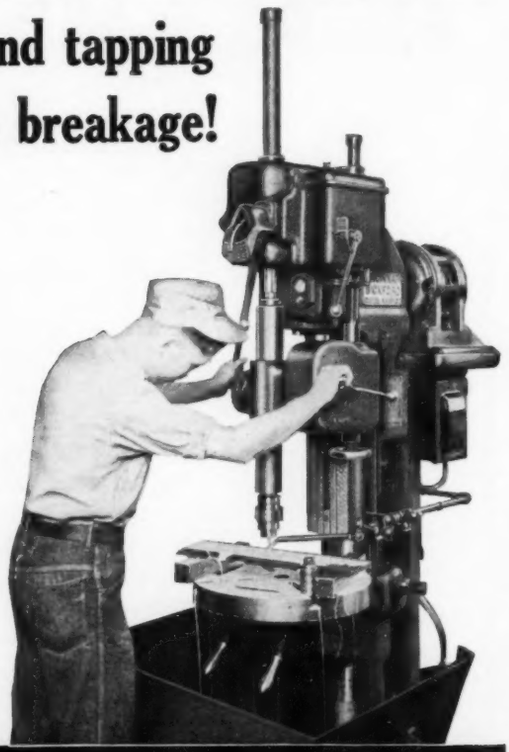
*Apparatus for Forming Sheet Metal Forms, Die.* James L. Auble, Cincinnati, Ohio, assigned to Frank Tea & Spice Co., Cincinnati, Ohio. Patent 2,143,429.

*Apparatus for Attaching Turbine Blades.* Arthur R. Allard, Drexel Hill, Pa., assigned to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Patent 2,143,463.

*Apparatus for Stagger Piling Metal Sheets.* George A. Kaufman, Aliquippa, Pa., assigned to Jones & Laughlin Steel Corp., Pittsburgh, Pa. Patent 2,143,779.


# Now

## Completed in 1/6th the former time required for hand tapping ...And no tap breakage!



21" Super-Service Upright Drill

In tapping 1/4" holes in the oil hardening tool steel of paper trimming knives, hand tapping was thought the only practical way of avoiding excessive tap breakage. Then this 21" Super-Service Upright took over the job. Production time dropped from 6 minutes to 1 minute per piece, without tap breakage.*

It takes a nicely balanced, easily handled precision machine, in short a Super-Service Upright, for your jobs similar to this. May we send explanatory bulletins?

* Customer's name on request.

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OAKLEY CINCINNATI OHIO U.S.A.


### January 17, 1939

#### Metal-Working Machinery

*Internal Grinding Machine.* Harry Hales Asbridge, Moss Lane, Ashton-on-Mersey, England, assigned to the Churchill Machine Tool Co., Ltd., Broadheath, England. Patent 2,144,043.

*Spring Making Machine,* George G. Powers and Clarence H. Frederick, Chicago, Ill., assigned to the Powers Spring Corp., Chicago, Ill. Patent 2,144,387.

*Means for Grinding Worms.* Orin P. Lively, Portsmouth, Va., assigned to Cone Worm Gear Corp. Patent 2,144,459.

#### Parts and Mechanisms

*Work Locating Device.* Edmund M. Erb, West Hartford, Conn., assigned to the Hartford Special Machinery Co., Hartford, Conn. Patent 2,144,486.

*Rotary Work Support for a Machine Tool.* Bengt R. Granberg, Rockford, Ill., assigned to Sundstrand Machine Tool Co., Rockford, Ill. Patent 2,144,490.

#### Processes

*Method of Making Valve Tappets.* Fred Glassford, Royal Oak, Mich., assigned to Chrysler Corp., Highland Park, Mich. Patent 2,144,147.

*Method of Making Welded Chain.* Edward Winthrop Taylor, Hammond, Ind., assigned to S. G. Taylor Chain Co., Hammond, Ind. Patent 2,144,319.

*Method of Forming a Bushing Structure.* Morris Schwartz, Chicago, Ill., assigned to Barrel Fitting & Seal Corp., Chicago, Ill. Patent 2,144,394.

*Process of Making Dry Shaver Parts.* Godfrey Dalkowitz, New York, N. Y., assigned to American Safety Razor Co., Brooklyn, N. Y. Patent 2,144,525.

#### Tools and Accessories

*Cutter Grinding Machine.* Kurt Zwick, Munich, Germany, assigned to Friedrich Deckel Prazisionsmechanick und Maschinenbau, Munich, Germany. Patent 2,144,095.

### January 24, 1939

#### Metal-Working Machinery

*Punch Press.* Eugene F. McClung, Huntington Park, and Paul S. Schildknecht, Los Angeles, Calif., assigned to Eugene F. McClung. Patent 2,144,684.

*Machine Tool, Lathe.* Bengt Granberg and John B. Sinderson, Rockford, Ill., assigned to Sundstrand Machine Tool Co., Rockford, Ill. Patent 2,144,735.

*Device for Working Sectional Shapes for Shafts and Bores.* Richard Mossdorf, Chemnitz, Germany, assigned to Ernst Krause & Co. A.-G., Vienna, Austria. Patent 2,144,771.

*Spot Welder.* Edward G. Beiderman, Detroit, Mich., assigned to General Motors Corp., Detroit, Mich. Patent 2,144,790.

*Lathe.* Leonida Antonelli, Padova, Italy,

assigned to Ufficio Tecnico Industriale Tessili Artificiali, Rome, Italy. Patent 2,144,955.

*Machine for Generating Gears.* Ernest Wildhaber, Irondequoit, N. Y., assigned to Gleason Works, Rochester, N. Y. Patent 2,145,000.

*Sheet Metal and Method of Producing the Same.* Robert R. Tanner, Detroit, Mich., assigned to the Patents Corp., Detroit, Mich. Patent 2,144,643.

*Method for Making Cutter Blades.* Frank P. Miller, Meadville, Pa. Patent 2,144,987.

*Welding.* James M. Keir, Niagara Falls, N. Y., assigned to Union Carbide & Carbon Corp. of New York. Patent 2,145,009.

*Grille and Method of Making the Same.* George Forrest Drake, Rockford, Ill., assigned to Barber-Colman Co., Rockford, Ill. Patent 2,145,073.

### Tools and Accessories

*Torque Measuring Wrench.* Herman W. Zimmerman, North Chicago, Ill., assigned to Frederick G. Wacker and Grace J. Wacker, Lake Forest, Ill. Patent 2,144,731.

*Gaging, Measuring, Setting, Indexing, and Like Instrument or Device.* Cecil Hirst, Withington, Manchester, England. Patent 2,144,972.

*Inserted Blade Cutter.* Frank P. Miller, Meadville, Pa. Patent 2,144,986.

*Optical Apparatus for Indicating the Position of a Tool.* Darnley E. Howard, Washington, D. C. Patent 2,145,116.

*Attachment for Refinishing Brake Drums.* Carl A. Backer, Houston, Tex. Patent 2,145,194.

## Tool Life and Cutting Oils

J. T. BEARD,
*Mechanical Engineer, Socony-Vacuum Oil Company*

Tool wear is the natural result of the abrasive action between the tool and the metal that is cut. Since all tools are harder than the work which they machine, the wear of any tool is gradual. The frictional rubbing between the tool and the metal, however, generates heat which draws the temper of the tool and hastens its wear. The heat depends on cutting pressure exerted by the chip, rubbing speed of the chip on the tool and coefficient of friction between the tool and the chip. The magnitude of the cutting pressures encountered is indicated in Table I.

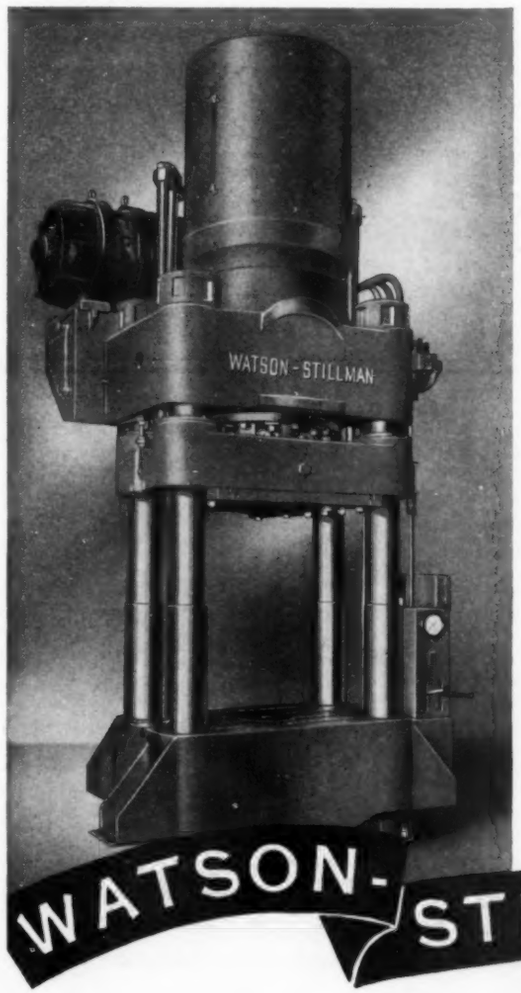
Machining oils serve two purposes: first, they reduce the coefficient of friction between the chip and tool; second, they cool the tool by carrying away some of the excess heat which is developed in spite of the reduction in friction.

The chief function of cutting oils (as differentiated from soluble oils) is to lubricate the cutting tool. The problem differs from the usual problem of bearing lubrication, since it is impossible to separate the metallic surfaces of the chip and the tool. The high cutting pressures will rupture the strongest film of any known lubricating oil, even that of the strongest extreme-pressure lubricants. Moreover, it is impossible to introduce cutting oil into the cutting and rubbing areas after the tool has once begun to cut, since there is no space or clearance between the metal and the tool.

The latter statement contradicts an old theory that the metal breaks away from the work in advance of the cutting edge thus opening up a convenient space for the oil to enter. According to this theory the chip or ribbon exerts no pressure at the cutting edge of the tool. However, recent macrophotographs of a newly ground cutting tool taken a few seconds after it has begun to cut show clearly that the tool has been materially worn by cutting pressure on the lip of the tool right at the cutting edge.

From a study of this condition it is improbable that there is an opening for the cutting oil to enter after the tool has once begun to cut. The lubricant which the tool receives while idle must resist the tremendous wiping action on the tool without any replacement until the cut is finished.

When cutting pressures are not excessive an ordinary mineral oil may offer adequate resistance, as in the machining of many metals such as aluminum, copper or brass. When cutting pressures are high, and especially when the cut is of long duration, as in threading steel, it is necessary to add various compounds or bases to the mineral oil in order

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to give it greater penetrating and adhesive properties.

The penetrating properties enable the oil to enter the infinitesimal pores of the tool. These pores act as minute reservoirs from which the microscopic film of oil on the lip of tool is replaced. Adhesive properties enable the oil to resist the wiping action of the chip which tends to remove it from the surface of the tool. The penetrating and adhesive properties which a cutting oil must have depend on the magnitude of the cutting pressures and the duration of the cut.

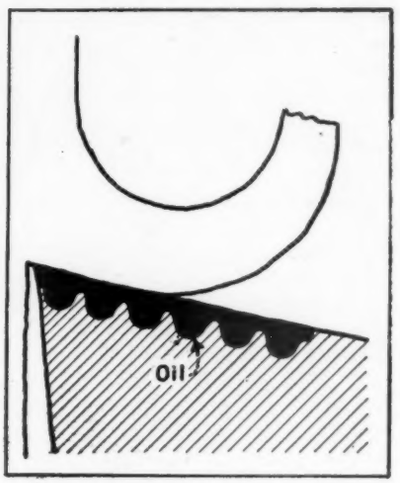
Mere penetration and adhesion are not sufficient. For example, kerosene or carbon tetrachloride penetrate quickly, but they do not lubricate. Tar is very adhesive but it also does not lubricate. In order to reduce frictional heat, therefore, the cutting oil or compound must have the added property of slipperiness or oiliness.

Pure fat, such as animal oil or vegetable oil, is added to a mineral oil to give a mixture which has sufficient penetration, adhesion and oiliness for light- and moderate-duty jobs, such as cutting aluminum, copper or brass. Heavier duty cutting is frequently done with sulphurized mineral oils. They offer somewhat greater resistance to cutting pressures because the sulphur gives additional penetration. For cutting hardened alloy steels, where cutting pressures are very high, sulphur compounds are frequently added either to straight mineral oils or to sulphurized mineral oils. The amount of free sulphur, or sulphur compound necessary to protect the tool against wear is readily determined once the type of metal, condition of metal, and machining operations are known.

Heavy-bodied oils provide greater adhesion than lighter oils. When properly compounded to give additional adhesion and adequate penetration, they are suitable for long, heavy-duty, low-speed cuts.

Another necessary function of cutting oils is to carry away as much heat as possible from the tool. The specific heat of mineral oils and cutting compounds is not good and cutting oils must, therefore, depend chiefly on their fluidity for whatever cooling action they may have.

In other words, the cooling ability of a cutting oil is largely a matter of oil viscosity. Light oils are quick-acting and are therefore used where cutting pressures are low and cutting speeds are high, such as in cutting aluminum, copper or brass, where adhesiveness is not as important as cooling. Heavy oils, on the other hand are slow-acting and, therefore, are not used except where cutting pressures are high and cutting speeds are low, such as in slow, heavy duty threading where cooling is not as important as adhesiveness.




*Pores in the steel tool tip provide tiny reservoirs which serve to replenish the oil film*

Since cutting pressure is also affected by the rate of feed of the cutting tool roughing cuts require

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special lubricating attention for best results. The cutting pressures previously referred to are commonly encountered in the machining of various metals with feeds not exceeding 0.010 in. per revolution of work or tool, as the case may be.

Many machining operations, however, employ coarser feeds particularly for roughing cuts. These coarse feeds subject the tools to correspondingly heavier cutting pressure, increased friction and abrasion with the probability of increased wear. In order to protect the tools and prolong their life in this severe service it is necessary to employ cutting oils that have maximum penetration and resistance to the wiping action of the chips. Moreover, the increased heating effect that accompanies such operations makes cooling an important requirement. Therefore, relatively low viscosity (high fluidity), consistent with adhesiveness and resistance to wiping, is desirable.

Tough metals are finished with difficulty because the machining of such metals is accompanied by an exceptional amount of plastic flow. Under these conditions a temperature is generated which is sufficient to fuse or weld particles of the metal to the lip or cutting face of the tool, especially when cutting pressures are high. This welded material becomes an integral part of the cutting tool. Moreover, it is constantly subjected to the active cutting pressure of the chip under which it becomes materially work-hardened.

The building up of this edge can be minimized by the use of a cutting oil having adequate penetrating properties and high resistance to the wiping action of the chip, particularly if such an oil contains sulphur in any form. The presence of sulphur at this critical point of the tool will retard the welding action. A certain amount of lubricity or oiliness is also necessary to minimize the scratching of the machined surface in case welding momentarily does occur.

In the machining of metals, there are certain conditions under which it is sometimes preferable to use non-corrosive cutting oils in spite of the fact that corrosive types may be somewhat more efficient; for example, where the copper tubing, bronze bearings, steel gibs and slides of the machine may become corroded after continued use; where the machined parts are to be subsequently chromium-plated or galvanized, and the presence of corrosive material interferes with the plating process; where machined parts are copper plated prior to a carburizing process to stop the carburizing effect at a certain point; or where non-ferrous metals are being machined. In some such cases, chlorine oils have been used as they are non-corrosive and possess good penetrating properties.

In general, it may be said that the majority of machining operations on ferrous metals are done with cutting oils that are more or less corrosive, because such products, when properly adjusted to the job are more efficient and more economical.

Soluble oils contain as their principal ingredient a large quantity of water, ranging from 10 to 50 parts or more. The very dilute emulsions have practically no resistance to the wiping action of a chip and no lubricity. The richer emulsions have very little more. They do little to prevent the development of heat. Their function is to cool the cutting tools and to provide a rust-preventing film on the machined parts.

Because of the large amount of water they contain, they are usually used where excessive heat is developed, either due to high cutting pressures or high cutting speeds. Since they have little or no lubricity they

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are not commonly used for finishing cuts. In view of their poor resistance to wiping, they are not generally effective for threading operations.

When trouble is encountered with the use of soluble oil, it is usually traceable to one of three distinct causes: the hardness of the water, acidity in the system or inversion of the emulsion.

Most soluble oils, as a result of their ingredients and manufacture, emulsify readily with hard water. Exceptional hardness, however, sometimes renders emulsification difficult. The use of such a mixture for metal cutting is followed by rusting of the finished parts. The addition of trisodium phosphate has a water-softening effect which renders the water more suitable for emulsifying purposes. More than 1 to 1½ per cent of trisodium phosphate, however, may seriously disturb the stability of the emulsion. As a rule, less than 1 per cent is usually sufficient for all except extremely hard waters.

Other alkalis, such as soda ash, borax and others, may be used for this purpose, but trisodium phosphate is preferred because the soluble oil emulsions will take greater quantities of it. Soda ash or borax should not be added in amounts greater than ½ to ¾ per cent.

Stable emulsions of soluble oils depend on the alkalinity of the mixture. If, for any reason, the emulsion acquires any marked acidity, the oil separates from the water. This separation is followed by rusting of the machined parts. If the separation of oil from the soluble-oil emulsions is not visible it can be checked for acidity by immersing a piece of blue litmus paper in it. The cause of the acidity may be found in some of the previous processing of the metal parts such as pickling baths.

The gradual loss of water from cutting-oil emulsions frequently produces a mixture so rich in oil that the emulsion changes from the usual oil-in-water phase (where the globule of oil is surrounded by an envelope of water) to the undesirable water-in-oil type (where the globule of water is surrounded by an envelope of oil). This inversion is generally caused by a gradual but continuous evaporation of water from the emulsion, aided by a more or less constant "steaming-off" of the water during cutting operations. The inverted emulsion is slimy and may have a disagreeable odor.

Inversion rarely occurs when the emulsion contains ten parts or more of water. It is desirable, therefore, to add enough water from time to time to keep the soluble oil emulsion at its proper strength. The actual richness of an emulsion at any given time can quickly be determined by adding a small quantity of hydrochloric (muriatic) acid to a small sample of the emulsion. The resulting acidity causes the oil and water to separate so that the relative amount of each is readily visible. The amount of water that should be added to the main system can then be calculated. If this procedure is followed systematically, there will be little danger of inversion and the consequent rusting of machined parts.


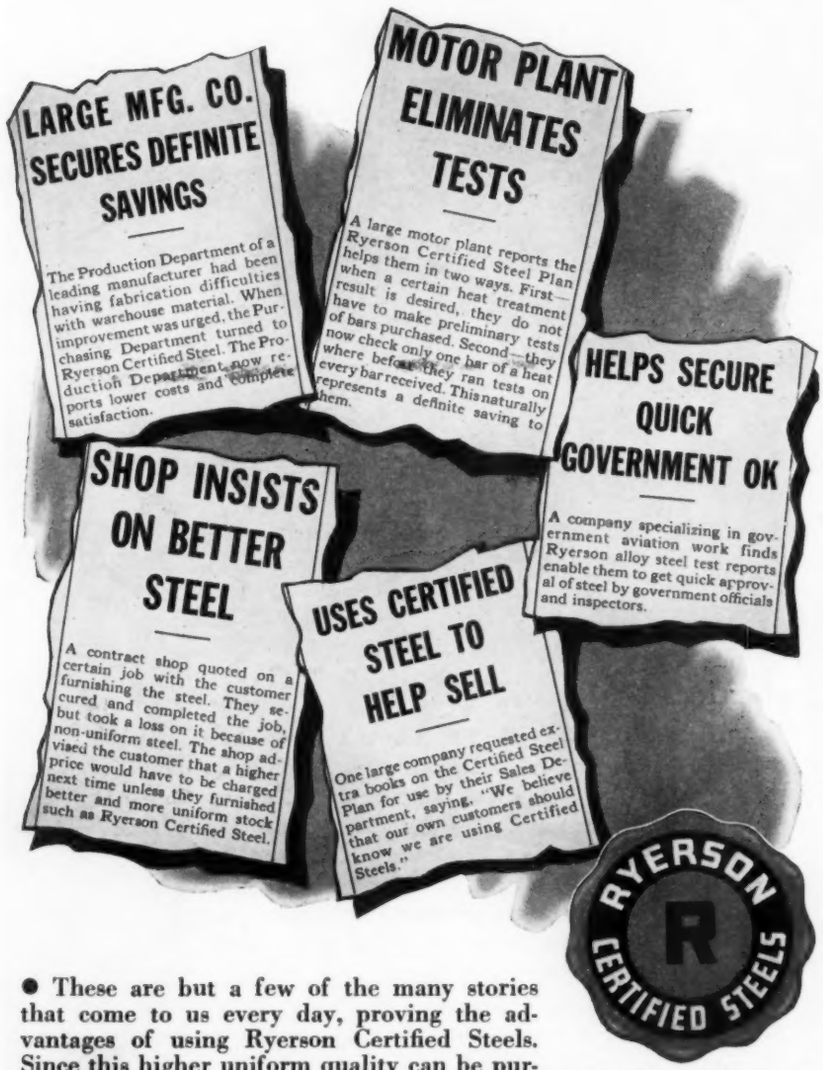
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**Table I**

| *Metal* | *Cutting Pressure** | *Cutting Speed*** |
|---|---|---|
| Aluminum | 50/150 | 170/450 |
| Soft Copper | 70/80 | 200/250 |
| Cast Iron | 80/160 | 200/400 |
| Hard Copper | 175/200 | 200/250 |
| Brass | 175/250 | 150/250 |
| Bronze | 150/350 | 120/400 |
| Monel Metal | 250/350 | 130/170 |
| Steel (not hardened) | 250/400 | 90/180 |
| Steel (300 Brinell) | 450/550 | 70/85 |
| 18-8 Stainless Steel | 300/350 | 65/75 |

* Thousand pounds per sq. in.

** Surface ft. per min. for turning operations with high-speed steel tools and feeds up to 0.010 in. per revolution of the work.